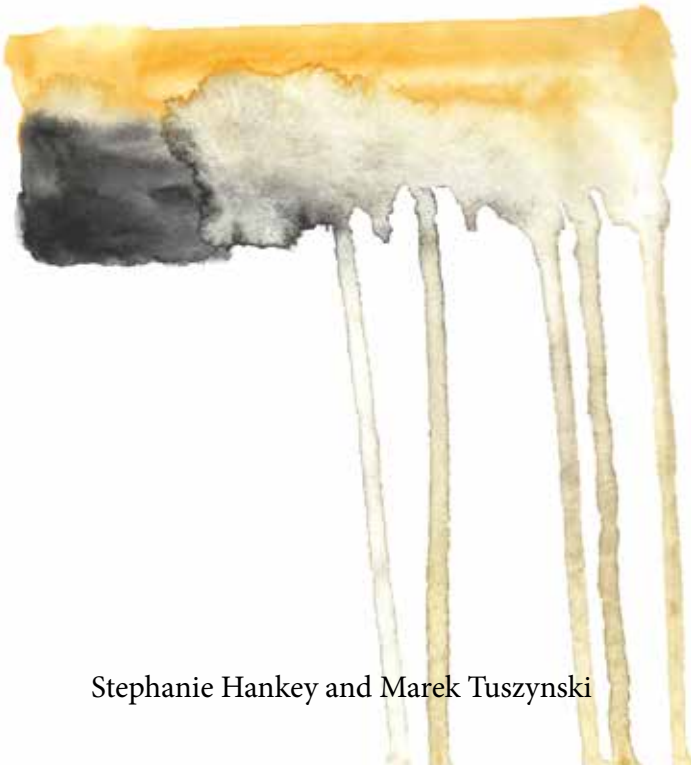
Efficiency and Madness

Using Data and Technology to Solve Social, Environmental and Political Problems



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Introduction

Technology as Magic and Loss

Technologies help us do more with less, they defy boundaries of space, time and self. They are an essential part of our daily lives, and they can be crucial in finding solutions to seemingly intractable problems. More recently, data-driven technologies – from social media to smart cities – have become an intrinsic part of the way we live. We experience them as both magic and loss.[1] That is, they are simultaneously incredible and devastating in the ways they change our lives – informing our immediate environment, changing our selves, our relationships with each other, and transforming the ways industries and institutions work. More than being 'good' or 'bad', these changes are simply paradigm-shifting.

1 Virginia Heffernan uses this phrase for the title of her book, *Magic and Loss: The Internet as Art* (New York: Simon & Schuster, 2016).

Data-driven technologies have rapidly proliferated because of breakthroughs in technology, science and commerce – in particular, the widespread availability of high-speed, low-cost, internet-enabled devices. At the same time, they have ushered in the unprecedented production, collection and processing of data. Whilst these conditions explain *how* these technologies have taken hold so quickly, they do not explain *why*. In fact, for well over a century, an underlying technocratic way of thinking has been developing – if we just had enough information and the right mechanisms, we could solve all problems, we could do more with less, we could even defy the finite boundaries of our selves and our planet. It is this logic – not just the technical developments themselves – that has driven the design and implementation of data-driven technologies. This is particularly true of problem-solving technologies, initiatives, designs and mega-projects, sometimes referred to as 'techno-solutionism' or 'technofixes'. The term 'technofix' describes the process of applying a technological solution to solve a problem. In recent years, it has been used more pejoratively, implying a short-cut or a patch on a problem with a lack of long-term or sustainable thinking. This essay does not assume this negative connotation; rather, we use it as a short-hand for a type of initiative that by its very design attempts to find a solution to a social, environmental, economic or political problem.

Because 'technofixes' seem to have magical advantages in terms of affordability, efficiency and scalability, they have been easily and broadly adopted. This has precipitated a fundamental shift in how governments, corporations, communities and individuals worldwide undertake the 'business' of problem-solving. In the last twenty years, this particular shift in solution-finding, which relies heavily on data-driven technologies, has been enabled by

the strength of the tech sector – sometimes referred to by the catch-all term 'Silicon Valley'. Made up of a variety of companies, from small start-ups to large-scale data-driven empires, the tech sector has nurtured and projected its own image of 'disruption'. This self-styled group of 'outsiders' – often made up of young engineers, marketeers and technologists – believe they are radically rethinking how things are done and should be done. In some cases, they see their businesses as somewhat altruistic, turning their unique skills, knowledge and tools to the world's problems and attempting to solve them. This may be somewhat true of their roots, emerging from California in the 1970s out of the ideology of the *Whole Earth Catalogue*.[2] But today, data-driven technologies are no longer only the domain of the tech sector; rather, they have become ingrained across most industries and comprise a fundamental part of the current political moment and its centres of wealth and power. A wide range of corporations have built off the successes of dot-com booms, whilst governments have embraced the disruption these companies have caused. Consequently, new questions are coming to the fore about the benign nature of these technologies. The initial euphoria that surrounded their democratising and equalising potential is levelling out. In its place are a host of documentaries, articles and books about the possible negative impacts of data-driven technologies on our societies and our selves, and about the emergence of new and largely unchecked centres of knowledge, wealth and power arising in their wake.

2 Stewart Brand's *Whole Earth Catalogue*, a publication that ran from 1968 to 1972, had a significant impact on the community of technologists that worked in California and brought together ideas of environmentalism, community and technology, available at wholeearth.com

Examining the challenges of technology and the rise of the data-driven society is not necessarily a pessimistic nor techno-phobic pursuit. Perhaps it is simply realistic. It is an approach that acknowledges technologies as a central part of our societies – both now and in the future – and which allows us to find tools to better understand their influence and impact. A constructive critique of technology can enable us to embrace them and harness their power, knowing that there is a certain inevitable momentum to their implementation. As with all industries and techno-scientific developments, a constructive critique can prevent us from walking blindly and endlessly into technology deployment, and instead allow us to ensure accountability and transparency, uphold ethical and sustainable practices, and put the necessary checks and balances in place in advance, not only in retrospect.

This essay is written from a practitioner's point of view, by technologists and activists working in the non-profit sector. It explores the impact of technologies, which are to a large extent currently data-driven technologies, on different social and political contexts. Working at the intersection of technology, civil society, government and the private sector, we examine the benefits and limitations of using technofixes to address social, environmental and political problems. As such, this text explores how we can develop a constructive critique that allows us to embrace the positive offerings of data-driven technologies, yet in equal measure to facilitate informed decision-making and reflection about how best to implement them. Fundamentally, it does this by acknowledging that the questions we currently face are not new.

This essay does not attempt to conclude by proposing solutions – which would be ideal but, in this case, unrealistic – but instead puts forward a series of reflections. It raises questions that emerge from the

text, intended as agitations – an invitation for citizens and civil society to get involved in a set of issues that is changing our societies. Which specific fields and actors have the power to reframe the discussion and engage in a new critique? Are there ways to divorce power – economic, political and knowledge-based – from policy and decision making? What is the role and potential of resistance? When, how and why do we just say 'no'?

This essay begins by adopting broader conceptual analyses from the work of academics and theorists, applied from the position of practitioners working internationally on technology deployment for social change. In doing so, it highlights insights from conceptual work that can improve practice and create a foundation for addressing the questions raised by the widespread deployment of data-driven technofixes. It then looks at how data-driven technologies are currently deployed to solve problems. It explores how they are created, by whom and with what goals in mind, and what dependencies they create between technology providers and users, as well as how they reflect and extend dominant power structures.

Lastly, it makes a case for why we cannot leave the challenges posed by data-driven technologies to technologists. It asserts that breaking down traditional barriers – past and present, practice and theory, expert and non-expert – can help us make informed choices based on a more diverse range of insights and knowledge. As technologies increasingly shape our way of seeing problems and solving them, critiques of both their triumphs and their disasters, their offerings and their failings, are needed by a broad range of actors. When we look more closely, the issues – perhaps unsurprisingly – are less about technology and more about how we want to organise our planet, our societies and our selves.

Formulating a Critique of Technology

We shape our technologies and our technologies shape us

In an essay on the increasing power of media to shape human perception, thought and action, Félix Guattari noted, 'New technologies foster efficiency and madness in the same flow.'[3] Technologies extend humans' abilities and increase our efficiency, allowing us to go beyond the otherwise finite boundaries of self, space and time, changing the context in which we live and the way things function. Often, new technologies are met with an equal combination of unbridled optimism and deep-seated fear, followed by a wave of experimentation and adaptation. After this, they tend to plateau and become widely adopted and commercialised. Some new technologies have

3 Félix Guattari, 'Towards a Post-Media Era', in *Provocative Alloys: A Post-Media Anthology*, eds. Clemens Apprich, Josephine Berry Slater, Anthony Iles, and Oliver Lerone Schultz (Leuphana: Post-Media Lab & Mute Books, 2013) p. 27.

an immediate yet transient impact on the way we live; others take more time to unfold, yet shape our societies indefinitely.

In an influential paper, Peter Haff introduced the term 'technosphere' in 2014 to describe the global proliferation of technology. Haff speculates that without the vast systems of transport, energy, communications, manufacturing, bureaucracy and other 'artificial' processes we depend upon, the global human population would '... quickly decline towards (our) Stone Age base' of less than ten million individuals.[4] The technosphere can thus be understood as a global, autonomous system – operating parallel to the biosphere and the stratosphere. This concept invites us to contemplate whether human civilisation, with its rapidly rising population, could continue without the technosphere. The point of asking this question is not to calculate how to survive a theoretical techno-apocalypse, but rather to acknowledge how much we depend on technology for our infrastructure, our economy, and even our individual health and survival, and therefore how necessary it is to find ways to make it work for us. Ironically, it is the technosphere itself that is increasingly jeopardising the stability of the biosphere and stratosphere.

As technologies change, so do the societies which produce and consume them. Technology reflects our immediate environment, extends and embeds power structures, and through its application and continual development, defines how the future unfolds. Its course, however, is not inevitable: we do not necessarily have to adopt every technology that is developed. Whilst critiques of the life sciences and bio-tech have been relatively successful in implementing checks and

4 Peter Haff, 'Humans and Technology in the Anthropocene: Six Rules', *The Anthropocene Review*, vol. 1, issue 2 (2014) pp. 126–136.

balances to slow down or control the development of some technologies, such as genetic engineering, the same checks and balances have not yet been put in place for data-driven technologies. For this reason, it is essential to formulate a constructive critique that represents different worldviews and interests, not just those of governments, industries, experts and private concerns.

The journalist and writer Evgeny Morozov believes that the critique of technology is deeply and inherently political.[5] If we try to discuss issues related to algorithmic governance as purely 'tech issues', for example, we are already undermining their significance and relegating our critical framework to an exclusively technical domain. Similarly, we need to move beyond thinking about technology in purely techno-utopic or techno-dystopic terms. We need to establish a position outside this binary continuum in order to grasp the complexity of the issues, the nuances of their social consequences and the possibilities for meaningful debates about technology in a democratic society.

This essay is concerned largely with the challenges that data-driven technologies pose when they are applied to solve social, political and environmental problems; however, many of the points may hold true for a range of technology-based solutions. Whilst these difficulties may feel new, the broader questions they raise are not. In this sense, looking at their impact from a position of reflection and critique can help us not only better understand why they are taking the shape they are, but also to look for better solutions and ways forward. By borrowing existing insights from the philosophy of technology, sociology and feminist and

5 Evgeny Morozov, 'What is technological sovereignty and why we need it', presented 14 October 2016 at Zündfunk Netzkongress 2016, Munich, Germany.

post-colonial theory, we can create a more holistic view of the impact of data-driven technologies on society, and most importantly, have the tools to embrace the challenges they present rather than ignoring them, or leaving them only to regulators.

Techno-science and technocratic ways of solving problems

Cybernetic and quantification-based ways of thinking have greatly influenced the development and implementation of technocratic initiatives. The dominant idea is that everything can be modelled, predicted and controlled through feedback loops.[6] Thus, a technocratic approach to a wide range of problems – from economics to the environment and from population control to poverty – appears along with an unshakable faith in data and computation as the best means to understand the complexity of the world and to invest in it profitably.

In an attempt to frame discussions about the role of technology in the development of democracies, scholars in the 1980s began using the term 'technoscience' to describe the fusion of advanced scientific research (whether through university laboratories, corporate research parks or state-funded military institutions) and the development and deployment of technologies to manage society.[7] According to historian James C. Scott, the merger of technoscientific practices with the discourse of modernisation helped produce a particular perspective on civilisation; that is, in the relationship

6 Norbert Wiener, *The Human Use of Human Beings: Cybernetics and Society* (Boston: Houghton Mifflin Harcourt, 1950).

7 See, for example, Timothy Mitchell, *Rule of Experts: Egypt, Techno-Politics, Modernity* (Los Angeles: University of California Press, 2002), and Donna J. Haraway, *Simians, Cyborgs and Women: The Reinvention of Nature* (Oxon: Routledge, 1991).

among technoscience, modernity and democracy, a Eurocentric vision of and for politics was crafted.[8] This image relied on science to ground technological innovation, which in turn promised to deliver a modernity that would foster democratic values.[9]

The symbiosis of technology and science and the opportunities afforded by the corporate sector have led to an environment in which the sciences have become digitised and data-driven, and technology companies have started to adopt the methodologies and concerns of science. The two fields share a common belief that if we just had enough information and the right techniques, humans could solve all our problems, select the species that thrive in our environments, or even defy death. Gene-editing technology, which has been heralded as a way to preserve biodiversity in the face of climate change, demonstrates this crossover from science to data-driven technologies. As Claire Hope Cummings explains, 'Gene drives represent the next frontier of genetic engineering, synthetic biology, and gene editing. The technology overrides the standard rules of genetic inheritance, ensuring that a particular trait, delivered by humans into an organism's DNA using advanced gene-editing technology, spreads to all subsequent generations, thereby altering the future of the entire species.'[10] A host of recent initiatives launched by leading Silicon Valley

8 See James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1998). See also, on the deployment of this vision, William Blum, *Killing Hope: US Military and CIA Interventions Since World War II* (London: Zed Books, 2014).

9 Isabelle Stengers, *Power and Invention: Situating Science*, trans. Paul Bains (Minneapolis & London: University of Minnesota Press, 1997).

10 Claire Hope Cummings, 'The Perils of Planned Extinctions', 6 September 2016, available at project-syndicate.org/commentary/gene-drive-conservation-risks-by-claire-h--cummings-2016-09.

investors and philanthropists exemplifies the inverse phenomenon, with 'tech-companies' moving into the sciences. In 2013, Google (now rebranded and reorganised as Alphabet) announced the founding of Calico, short for California Life Company, which has a 1.5-billion-dollar investment from Google to 'combat aging' with the goal of extending individual human life beyond 120 years.[11] Similar initiatives can be found in the areas of reproductive medicine, geo-engineering and aerospace.[12] The ethics of such widespread manipulation of nature cannot be considered merely 'technological' or 'scientific', but rather the digital and data-driven nature of the solutions should be recognised and incorporated within their critique. There are some existing initiatives that critique the data-orientated nature of some of these projects as well as the potential for their misuse. One example is the Diversity Seek (DivSeek) digital gene-banking project, which aims to coordinate databases documenting hundreds of thousands of genomes of crop plants. Yet such projects are rarely incorporated in cross-disciplinary analyses of the challenges created by data-driven technofixes.[13]

11 Claire Hope Cummings, *Uncertain Peril: Genetic Engineering and the Future of Seeds* (Boston: Beacon Press, 2008). See, for a similar example related to the Google-backed company Calico, Ariana Eunjung Cha, 'Tech Titans' Latest Project: Defy Death', *Washington Post*, 4 April 2015, available at washingtonpost.com/sf/national/2015/04/04/tech-titans-latest-project-defy-death/?utm_term=.4b6c773301fe.

12 See Sarah Scoles, 'The Unknown Startups Fueling Aerospace With Fancy Tech', *Wired*, 13 June 2017, available at wired.com/story/the-unknown-startups-fueling-aerospace-with-fancy-tech/ and Sarah Emerson, 'Why Does Silicon Valley Want to Get So Many Women Pregnant?', *Motherboard*, 22 April 2016, available at motherboard.vice.com/en_us/article/nz7ebm/why-does-silicon-valley-want-to-get-so-many-women-pregnant-fertility-apps

13 Edward Hammond, 'Sequence Data and Benefit Sharing: DivSeek's Pitfalls Show Need for Appropriate Policy', in *Biodiversity, Knowledge and Rights Series*, no. 5, 2017

These initiatives raise dilemmas that academia, science and medicine have had to grapple with for some time, but which are relatively new to the data-driven technology sector, where – on the whole – ethical dilemmas are mostly dealt with by lawyers and PR departments. These initiatives seem to make sense in the abstract, but the reality of their implementation is in stark contrast to their designs. James C. Scott's influential book, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*, demonstrates this extensively and shows the disconnect between schemes to organise humanity compared to the somewhat chaotic nature of reality. Morozov picks up this position and puts the thought in blunt terms: '[Solutionists] have a very poor grasp not just of human nature but also of the complex practices that this nature begets and thrives on. It's as as if the solutionists have never lived a life of their own but learned everything they know from books – and those books weren't novels but manuals for refrigerators, vacuum cleaners, and washing machines.'[14]

Technology as techno-structuralist

The political nature of technology is widely recognised, particularly within academic circles and those working on the philosophy of technology. Langdon Winner states, 'What matters is not technology itself but the social or economic system in which it is embedded.'[15] Such a view allows us to see technologies as instantiated ideologies that reinforce and echo significant ethical and political predica-

14 Evgeny Morozov, *To Save Everything Click Here: The Folly of Technological Solutionism* (New York: Public Affairs, 2013).

15 Langdon Winner, 'Do Artifacts Have Politics?', *Daedalus*, Vol. 109, No. 1, Modern Technology: Problem or Opportunity? (Winter,1980), pp. 121-136, MIT Press

ments. Recognising technologies as extensions of our existing ways of thinking and behaving also enables us to consider them based on our political, social and economic environments, rather than only as the domain of 'experts'. Emerging fields such as geo-engineering – large-scale technical schemes to counter the impact of climate change – pose such challenges. Many geo-engineering solutions are a hybrid of data-driven, technological, engineering and science-based solutions, yet regardless of the fields from which they emerge, they present dilemmas that need to be addressed outside of their respective domains of expertise. For example, how should we approach discussions around geo-engineering in the context of planetary climate change?[16] Thus far, media debates have led us to think more about the specific technologies deployed and their potential performance, but they rarely weigh our moral responsibility to future generations against the potential risks. These are not easy problems to tackle and need to be treated as dilemmas. Some critiques of geo-engineering focus on the high-risk nature of the interventions, including some proposed technologies that have well known negative effects. Others point out that their long-term impact is unpredictable. This is the case with many technologies that have come before them – seemingly problem-solving, large-scale interventions which then have significant impacts on the ecosystem and a range of unintended consequences for individuals affected by the changes. These dilemmas often lead to trade-offs and worst-case scenarios. Some practitioners, activists and thinkers within the environmental movement have begun to lay

16 Clive Hamilton, *Defiant Earth: The Fate of Humans in the Anthropocene* (London: Polity Press, 2017).

more constructive grounds for discussing them.[17] Some argue that geo-engineering technologies have the potential to solve irreversible problems and that it is our responsibility to future generations to start work on this now; others contend that technologies will only create new problems. Thinking about these technologies in the broader scope of social and ethical life and understanding them as part of existing power plays between industry and civil society helps reframe their applications not only within a particular cultural, economic and historical moment, but also within a broader philosophical context, where means and ends are not easily disentangled.[18]

Recognising that the development of technology echoes the social and political projects of a particular time enables more widespread engagement with the questions it raises. In particular, it can help us understand data-driven technologies as a *modus operandi* of certain ideologies and agendas, as well as their role in forming power structures, creating new risks and reinforcing inequities. In his 1990 book, *Technologies of Power*, Majid Tehranian defined a 'techno-structuralist' perspective of technology, as opposed to a 'techno-neutral' one.[19] That is, we have to look at technologies within the context of the power structures they come from,

17 Stephen M. Gardiner, 'Is "Arming the Future" with Geoengineering Really the Lesser Evil? Some Doubts about the Ethics of Intentionally Manipulating the Climate System' in *Climate Ethics: Essential Reading*, eds. Stephen M. Gardiner, Simon Caney, Dale Jamieson and Henry Shue (Oxford: Oxford University Press, 2010).

18 See, as one example, the 'ecosophy', which Félix Guattari defined following the work of Arne Naess on 'deep ecology', as the need for a link between environmental, social and mental ecologies. Félix Guattari, *The Three Ecologies*, trans. Ian Pindar and Paul Sutton (London and New York: Bloomsbury, 2014).

19 Majid Tehranian, *Technologies of Power: Information Machines and Democratic Prospects* (Norwood: Ablex Pub., 1990)

which dictate how they are conceptualised, designed, funded and used. Therefore, the central questions are who decides, who manages and who benefits from them. In this sense, Tehranian does not claim that technologies are pre-determined to have a certain negative or top-down form or impact, but rather that they can either serve the elite or serve democracy. For this reason, realising the democratic potential of any technology is an ongoing struggle.

As an example, take the shadow that has been cast over the initial optimism surrounding the relationship among data-driven technologies, democracy and inclusion. We are now seeing evidence that digital technologies may in fact create diminished worldviews and reinforce prejudices through 'filter bubbles', rather than bringing us closer together. Large-scale social media platforms, in particular, may serve to amplify prejudices and inequities. Questions of how to navigate these tensions are particularly problematic in fighting online hate speech and harassment, where best practices and frameworks need to be considered and further developed and tested. These data-driven technologies present not only solutions for connecting people, but also the problems that arise from doing so. Zeynep Tufekci deconstructs the problematic nature of the 'democratising force' of social media tools in her recent book, demonstrating both the power and the weakness of using data-driven technologies for mobilising large numbers of people for protest and online organising.[20]

For Sheila Jasanoff, 'to reclaim human rights in a world governed by technology, we must understand how power is delegated to technological systems.'[21]

20 Zeynep Tufekci, *Twitter and Tear Gas: The Power and Fragility of Networked Protest* (New Haven: Yale University Press, 2017).

21 Sheila Jasanoff, *The Ethics of Invention: Technology and the Human Future* (New York: W. W. Norton & Company, 2016).

There are three key existing modes of critique that deal with this delegation of power and can help us engage with the issues at hand: 1) Feminist Critique; 2) Science & Technology Critique; and 3) Postcolonial and Development Critique.

Feminist Critique

The feminist philosopher of science Donna J. Haraway has expressed many of the key themes and concerns shared by feminist critics of technoscience. In her landmark essay 'Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspectives', Haraway demonstrated that technoscience aimed to achieve a total perspective, or what she called a 'God's Eye View' of society and the environment. It is almost ironic that within some large-scale, data-driven technology companies, the system that allows internal staff to see what their users are actually doing on their system at any time is literally called 'God View'. In the case of Uber, the 'God View' function was removed after public critique of its lack of security within the company, now perhaps significantly replaced with a system renamed 'Heaven View'.[22] For Haraway, as for other feminist thinkers such as Isabelle Stengers and Anna Tsing, this dominant and dominating technoscientific vision is the most disconcerting in a democracy.[23] At a mega-project level, this is the type of vision, for example, which has led to geo-engineering proposals that would intentionally alter Earth's atmosphere.

22 See Alex Hern, 'Uber employees spied on ex-partners, politicians and Beyonce', *The Guardian*, 13 December 2016, available at theguardian.com/technology/2016/dec/13/uber-employees-spying-ex-partners-politicians-beyonce

23 Anna Lowenhaupt Tsing, *Friction: An Ethnography of Global Connection* (Princeton: Princeton University Press, 2005).

According to feminist criticism, it is only because of a *fantasy* of a total perspective that geo-engineering could make such proposals.[24] No perspective is ever total, and the unintended consequences of such massive technoscientific endeavours could create much larger problems than the ones they are meant to solve. Thus, from the perspective of feminist critique, it is important to emphasise the role of technoscience in normalising the idea of a 'God's Eye View', or a way of seeing and formulating problems that often occur to the detriment of other important social or environmental concerns. This way of thinking is in fact a driving force of many big data projects.

Science & Technology Critique

Another important critique of technoscience and its relationship to modernity and democracy has been developed by Bruno Latour, especially in his book *We Have Never Been Modern*.[25] For Latour, 'the moderns' (as he calls them) strongly believe in their ability to separate matters of fact (i.e. science) and matters of concern (social issues).[26] However, according to Latour, this separation is fraught, not least because of the social consequences of technoscience. From this point of view, it is vital to develop new ways to 'bring the sciences into democracy' so that technology can participate in and be affected by democratic matters of concern.

24 Clive Hamilton, *Earthmasters: The Dawn of the Age of Climate Engineering* (New Haven: Yale University Press, 2014).

25 Bruno Latour, *We Have Never Been Modern* (Cambridge, MA.: Harvard University Press, 1993).

26 Latour, *We Have Never Been Modern.* See also Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network Theory* (Oxford: Oxford University Press, 2005) and Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy* (Cambridge, MA.: Harvard University Press, 2004).

These criticisms have been developed even further in an innovative reading of technology by theorist Benjamin H. Bratton in his book *The Stack*.[27] For Bratton, the long arc of political visibility and legibility – from surnames to street addresses, postal codes to TCP/IP protocols – has helped produce an 'accidental megastructure'. Instead of seeing all of these elements of planetary computation as 'a hodgepodge of different species of computing, spinning out on their own at different scales and tempos', Bratton contends, 'we should see them as forming a coherent and interdependent whole. These technologies align, layer by layer, into something like a vast, if also incomplete, pervasive if also irregular, software and hardware *Stack*.'[28] Comprised of six autonomous yet interdependent layers – Earth, Cloud, City, Address, Interface, User – the Stack spins out consequences for society in every direction and dimension.

Drawing on Latour and Bratton, understanding technoscience requires attention to the ways in which it shapes our everyday concerns as well as our immediate environment. For example, recent debates about 'net neutrality' could dramatically transform the architecture of the internet itself, yet the discussion is treated as if it is for 'experts only', as if the regulation and coordination of the internet's infrastructure were not in itself a political issue. But the internet is a part of our political systems and political views, as well as our social lives. The various abilities of these technoscientific aspects to act on each other, and on us, makes them what Latour calls 'actants' with an agency of their own. Importantly,

27 Benjamin H. Bratton, *The Stack: On Software and Sovereignty* (Cambridge, MA.: MIT Press, 2016).

28 Bratton, p. 5.

it is precisely the agency of these technoscientific products that makes understanding their political and social dimensions a crucial matter that should not only be left to 'experts' but rather integrated into civil society discourse and engagement.

Postcolonial and Development Critique

A third line of critique regarding technoscience is that of 'development' as a political issue. The anthropologist Gilbert Rist has shown that technology has played a formidable role in the global and globalising project of development.[29] For Rist, as for many other thinkers in post-colonial and development studies, technoscience has been a 'carrier' of the project of development, often under the flag of modernisation. While this global project has, in some cases, helped support and sustain democratic movements, it has just as often undermined these movements in favour of authoritarian regimes or autocratic powers. Like Rist, development scholar Arturo Escobar notes that when we encounter 'development' it is often framed by technological projects allegedly for the benefit of local residents; however, the profitability of these schemes often calls into question the legitimacy of such claims.[30]

For example, the 'modernisation' of the Tennessee Valley in the United States in the early twentieth century was presented to the public as a socially-oriented

29 Gilbert Rist, *The History of Development: From Western Origins to Global Faith*, trans. Patrick Camiller (London and New York: Zed Books, 2002). See also Gilbert Rist, *The Delusions of Economics: The Misguided Certainties of a Hazardous Science* (London: Zed Books, 2011).

30 Arturo Escobar, *Encountering Development: The Making and Unmaking of the Third World* (Princeton: Princeton University Press, 1995); see also, Maurizio Lazzarato, *Signs and Machines: Capitalism and the Production of Subjectivity*, trans. Joshua David Jordan (Los Angeles: Semiotext(e), 2014).

development project; yet it is now clear that the construction of many hydro-dams under the Tennessee Valley Authority was aimed at achieving energy independence for the aluminium industry and related industries, at the cost of displacing tens of thousands of longtime local residents from the newly-created catchment areas for the dams.

This is of course not an isolated case. Examples of technology projects that are sold as development but have a double or even hidden agenda can be found around the world. A more contemporary example is the use of iris-scanning technology to provide emergency relief support to Syrian refugees. In 2015, UNHCR introduced a technology that scans the irises of individuals; a form of identification that is reportedly more efficient than finger printing, as the unique patterns in the iris last a person's lifetime. This form of identification is used to provide refugees with access to money and food, ensuring equal distribution of resources and avoiding some of the difficulties that come with keeping hold of cards and other more material forms of identification amongst refugee communities. However, the company that was contracted to provide the technology has the former head of the British Intelligence Services MI6 and the former Homeland Security Advisor to George W. Bush on its board. The initiative uses an invasive and life-long form of identification with people who, at that moment, are not in a position to do anything other than agree. In addition, we still do not know how else this data will be used in the long term.

More recently, Saskia Sassen has contended that contemporary technologies, especially digital technologies developed for financial transactions and speculation, are often deployed to maximise profits in a mode that is inextricably linked to more archaic forms of brutality such as police and military violence,

land grabs, theft and intimidation.[31] The pursuit of profit by large global companies utilising data-driven technologies has been more recently critiqued as a post-colonial strategy. Facebook's project to bring low-cost internet access to parts of the developing world by creating a closed gateway to the internet, known as Facebook Zero, has met with resistance, most notably in India where the government blocked its roll-out in 2016. The dominance of global companies that centralise data gathering, access and ownership produces information monopolies and unparalleled centres of knowledge and wealth. In this environment the interests and needs of different actors at the national and regional level are extremely difficult, if not impossible, to represent. From agriculture to pharmaceuticals and from transport to communications, the advantages of data monopolies are reinforcing both former and emerging geo-political power dynamics, giving a post-colonial critique of technologies new relevance and urgency.

Technoscience, modernity and democracy have often been linked in a *vicious*, rather than *virtuous*, circle. The consequences of such a cycle are typically a matter of more specific, local contexts and the details of the technology at hand. Each of the reflections outlined above comes from different disciplines and perspectives, but they all acknowledge the relevance of political and personal viewpoints and agendas in their design, as well as the role played by various assumptions, beliefs and contexts in their implementation. Our analysis borrows from many different fields of enquiry, yet in doing so – even at a cursory level – it can help practitioners find starting points to build constructive critiques. Reading technological developments in context and forming

31 Saskia Sassen, *Expulsions: Brutality and Complexity in the Global Economy* (Cambridge, MA.: Harvard University Press, 2014).

a framework to help us understand them from a broader historical and political perspective may remind us that whilst the details of each technology may be new, the challenges they raise for society are not necessarily new at all.

Data-Driven Technofixes

'Today's agitated nation-states and overreaching institutions often act according to the fantasy that given sufficient information, threats, disasters, and disruptions can be predicted and controlled; economies can be managed; and profit margins can be elevated. This new belief in technological solutions fostered by data analysis, reality mining, pattern recognition, and forecasting increasingly dominates all aspects of contemporary society and replaces political and hermeneutical processes.'[32]

The idea that masses of information can enable everything from factories to countries to run more efficiently is clearly not new. It has long been an impetus for any number of designs, products, services and systems – sometimes in the form of grand, futuristic schemes whose vision and style were way ahead of the technologies and their capabilities at the time.

32 Anselm Franke, Stephanie Hankey, Marek Tuszynski, eds. *Nervous Systems: Quantified Life and the Social Question* (Berlin: Haus der Kulturen der Welt, 2016).

Chilean president Salvador Allende's now infamous project, Cybersyn, is a perfect illustration. In the early 1970s, Allende employed English cybernetician Stafford Beer to help him develop a *StarTrek*–style control room full of data projections. The idea was that from this room, decision makers in government could continuously see information graphics showing how the country was running; a constant feedback loop displaying what was happening on the ground with the people, industry and the economy. The project was a technocratic, idealistic and beautifully simplified way of dealing with the complex problem of running a country. Such schemes may sound far-fetched, but they have been iterated in many different contexts, often driven by those responsible for governing a country and keeping it 'secure'.

A more invasive version of what Beer dreamt up for Allende was eventually realised by US admiral John Poindexter: a nation-wide surveillance 'total information awareness' system, designed in the wake of 9/11. It was not officially passed for implementation in the US, but it was transported to Singapore to help the country create a comprehensive 'smart nation' system of total surveillance, a way of tapping into the entire country's telephone, internet and mobile phone traffic (in the US it was adapted to become the 'Terrorist Information Awareness' system). At the invitation of Peter Ho, Singapore's then Secretary of Defence, Poindexter's vision was realised with the aim of protecting the island nation-state's interests: controlling disease, the economy and national security. Since the initial system was put in place, it has been applied to many different aspects of public life with varying degrees of success. It has been used to control traffic-flows through mandatory state-owned GPS systems in cars, as well as to regulate citizens' consumption of energy and provide remote care for

the elderly through sensors and cameras placed in all public housing projects. The smart nation initiative is a widespread and fundamental part of Singapore's administration of public services and national security. In its attempts to use technology to pre-control problems, it can even be seen as a kind of preemptive technofix. The 'preemptive' nature of technofixes is very much part of their rationale. Often they emerge as schemes funded and supported for their ability to mitigate problems before they become significantly disruptive. This is especially true of those that hold the potential to impact national security. Due to the significance of these problems, as in the geo-engineering example mentioned earlier, they also often have a strong national-security and military aspect to their processes of research and development, even if the private sector ends up stepping in to realise their roll-out.[33]

Whether using data-driven technologies to anticipate social, economic, environmental and political problems, or solve them, a host of such initiatives can be found on a smaller scale around the world – from smart ID cards for citizens to smart energy-grids for cities, and from predictive systems for employment to predictive policing for specific communities. On the surface, these technologies sound elitist – luxury problems for some of the world's wealthiest countries. However, due to partnerships between governments and industries and the reportedly low costs of implementation, many such projects are specifically sold to national or local governments that lack financial resources and face significant challenges. In Nigeria, for example, a much-needed national ID project has been introduced, run by

33 See 'A civil society briefing on Geoengineering: Climate change, smoke and mirrors' http://www.etcgroup.org/sites/www.etcgroup.org/files/files/etc_hbf_geobriefing_may2017.pdf

Mastercard. The programme creates a single point of data on citizens' movements, access to resources and spending – all collected and stored by Mastercard.[34] In Israel, 'pre-crime' technologies are being used to arrest potential Palestinian trouble-makers.[35] And in North America, local authorities struggling to make public transport work are making deals with ride-sharing companies such as Uber.[36] The disparate nature of these examples illustrates just how widespread data-driven technology projects have become across governments, from managing populations to law enforcement and public transport. Technofixes have become a standard way of operating.

The timing of these initiatives is not incidental. Such projects are only made possible because of technological and infrastructural advances made by the business sector, combined with the normalisation of data-driven technologies such as mobile phones and sensors in our everyday lives. This shift has come about via a combination of ubiquitous, cheap mobile computing and large-scale, globally-networked data processing, but also due to an extremely successful data-business model. Without these changes, many of these grand schemes to 'datify' the way countries are run would, metaphorically speaking, still be at the drawing-board level. These three key elements combined – the availability of technologies, the normalisation and integration of their use and the success of the data-driven business model – have created the

34 See 'Nigeria launches national electronic ID cards', *BBC News*, 28 August 2014, available at bbc.com/news/world-africa-28970411

35 See John Brown, 'Arrest of Palestinians for Potential Terror Attacks Brings New Meaning to "Minority Report"', *Haaretz*, 24 April 2017, available at haaretz.com/opinion/.premium-1.785470

36 See Joshua Brustein, 'Uber and Lyft want to replace public buses', *Bloomberg Technology*, 15 August 2016, available at bloomberg.com/news/articles/2016-08-15/uber-and-lyft-want-to-replace-public-buses

gold dust that is sometimes referred to as 'big data'. Big data has, in turn, led to major shifts in the way we live, work and play.

Data and the 'new extractive industry'

The phrase 'data is the new oil' is often used to describe the widespread acquisition of data and its impact on power, wealth and associated efforts to gain it. By its very nature, it implies a kind of gold rush – a host of actors trying to profit from its advantages. Data-driven companies are currently some of the wealthiest companies in the world, and the accumulation of masses of information creates critical assets in different corporate domains that yield unique insights and therefore further market advantages. Most important, such acquisition of knowledge is only possible through the comprehensive, detailed and consistent collection of massive amounts of data from users at the micro-level which, when aggregated, becomes meaningful and creates value.

Each data point by itself may be useless, but together with millions of other data points, it becomes priceless; whether this is data collected through loyalty cards on what we buy, or data collected through sensors on how the traffic flows. In order for a data-driven technology to successfully provide insights and find solutions, it needs to have scale and continuously collect a vast amount of relevant information. Such a mechanism is only realistic, affordable and sustainable through systems that are designed to work with millions of self-entering data nodes, which, in return for services, provide consistent, reliable and detailed information. Consider billions of mobile phones, millions of RFID tags on objects, thousands of sensors on cars or smart meters, all as devices for gathering data. We tend to think about these

products and objects in their capacity to provide services to end-users, and they do. Yet, conversely, they also provide services to a centralised resource. For many users, this is perhaps the more opaque part of the exchange. When effectively gathered, analysed and interpreted, the data presents patterns, trends and unique insights that can be used by technology providers to create value, provide other services, devise competitive advantages, or simply be resold.

The design of such systems creates a natural co-dependency. The technology provider, as the central resource, provides a valuable service and sets the boundaries and rules of engagement for the users, as the nodes. Yet without the users providing the data, the technology provider has nothing of value to use, and nothing of value to offer. The recent popularity of the menstruation app, Clue, made by a start-up in Germany, illustrates the point. In order for the app to track a woman's menstrual cycle, the user regularly enters detailed data about a wide range of intimate details: how she slept, if she is taking medication or exercising, if she has had intercourse, and so on. Based on this, the app gives the user a predicted calendar of her cycle. The more accurate and detailed the information, the more accurate and detailed the result. Clue's business model, however, is to aggregate these insights to create a unique detailed data-set of women's menstruation according to demographics, lifestyle and geography. This information is then sold to research institutions, and one could imagine in the future, to companies. This is a data-set that had previously been impossible to gather, partly because of its personal and somewhat taboo nature, but also due to the ethics review processes that normally restrict such research projects. But because of a lack of regulation, such restrictions do not apply to apps, in particular those where the users have clicked 'I agree'.

We live in an era of technology in which it is *our* cumulative, collective, cognitive or action-based labour that creates value in the system, through a relatively opaque form of exchange. Following on from the oil metaphor, this dynamic is increasingly referred to as the '*new* extractive industry'. In this system, the users – through their devices and sensors – become the self-motivated and self-entered data points, enabling the growth of data-driven services and products that continuously reshape the contexts of our daily lives. This has significant implications for power dynamics and for the centralisation of knowledge, wealth and power.

Working in 1964, the technology historian Lewis Mumford described such a system as a 'magnificent bribe'. Mumford defined some technologies as inherently authoritarian and others as inherently democratic. For him, 'the first system-centered, immensely powerful, but inherently unstable, the other man-centered, relatively weak, but resourceful and durable.'[37] Two types of technologies are often cited as examples: nuclear power (authoritarian and necessarily top-down) and solar power (democratic and with the potential to be bottom-up). What Mumford accurately predicted, however, writing nearly three decades before the proliferation of the internet, sensors, chips and mobile phones, is that dominant technologies would become a hybrid of 'democratic-authoritarian'. Technologies would be both centralised and top-down, grassroots and bottom-up, creating a co-dependency between those who provide technologies (typically companies and governments) and those who use it (typically citizens). He describes these technologies as paradoxical and

37 Lewis Mumford, 'Authoritarian and Democratic Technics: Technology and Culture' in *Technology and Culture*, Vol. 5, No. 1 (Winter, 1964).

ironic: 'each member of the community may claim every material advantage, every intellectual and emotion stimulus he may desire, in quantities hardly available hitherto even for a restricted minority.'[38] But Mumford predicted that in accepting the 'democratic-authoritarian social contract', the individual will have surrendered 'one's life at source' in a way that authoritarian technics dominate society, while occasionally giving back 'democratically'.[39]

Mumford goes on to describe this exchange as a 'magnificent bribe'.[40] The bribe, or trade-off, today, is essentially that users agree to give up their data in exchange for often free access to digital services, thereby providing centralised data collectors with the raw material needed to derive valuable intelligence. We enter this exchange in return for services that are free or low-cost. Individually, we may do it to receive significant savings and benefits, convenience, or efficiency. We may also willingly take part to benefit from our personal predictive data analysis and feedback loops on our sleep, food intake, or household energy performance. Organisations and institutions accept this exchange for similar reasons – to be more efficient, accurate and effective, but also to outsource, automatise and downsize – essentially, to do more with less.

For the end-user, these co-dependencies do not align with existing ideas of ownership, consent or control. We end up with outdated and barely relevant concepts like 'privacy', which don't represent or solve any of the problems that arise from such a dynamic. Antoinette Rouvroy asks, what is 'self-constitution, individual agency and constitutional self-government'

38 Mumford.

39 Mumford.

40 Mumford.

in an age of autonomic computing and ambient intelligence?[41] Meaning is extracted from patterns in our data by algorithms written by data scientists. Patterns form from data on our behaviour; disconnected assets, processes and outputs that may not represent our normal understanding of the self or the thing or action that produced the data in the first instance.

To illustrate the point: data is extracted by the technology provider on actions, habits and patterns (individual data). That individual data is then separated from its source, and turned into data about that particular pattern. In some cases, our rhythms and routines, such as a daily commute or our music-listening habits, lead to interpretations about what kind of person we are (observed data) or become separated from us altogether to form precious information about trends that is then used by the company to further understand the users' needs or sold to third parties. In other cases, data about whom we are close to and what we do becomes data associated with us. For example, details about a woman's IVF treatment may end up as data about her fertility *and* her partner's fertility (implied data). When individual, observed and implied data are merged and compared with the data of others, it is still data from us, but it is no longer recognisable to us, even if we could see or understand it.

Sheila Jasanoff asks, 'what is the status of materials derived from our bodies and selves, whether these are physical entities such as genes or digital records of our words and transactions?'[42] With such a con-

41 Antoinette Rouvroy, *Law, Human Agency and Autonomic Computing: The Philosophy of Law Meets the Philosophy of Technology* (London and New York: Routledge, 2011).

42 Sheila Jasanoff, *The Ethics of Invention: Technology and the Human Future* (New York: W.W. Norton & Company, 2016).

struct, questions of ownership, rights and ultimately responsibility and accountability cannot stretch to these scenarios, reinforcing the fact that frameworks such as 'privacy', 'consent' and 'intellectual property' are no longer sufficient ways of understanding, engaging with and regulating these issues. Who benefits from the insights gleaned from deeply personal bodily functions, such as menstrual cycles or rest and exercise data from fitness trackers? What constitutes anonymity or informed consent when data collection is ambient, as in the smart city? Ultimately, what is 'personal data' in an age where data is everything but personal? In such a context, the question of rights and consent, and questions of accountability and transparency need to be completely reframed.

Data monopolies and the meta data society

If a technology provider is lucky enough to get traction with its service, it has a kind of natural snowball effect; the more data the service has the more effective it is; the more effective it is the more users it has; the more users the service has, the better the quality of its service, and so on. According to philosopher Matteo Pasquinelli, 'Data centers accumulate "big data"– vast bodies of information about the world's climate, stock markets, commodity supply chains, phone communications and social networks of billions of people, for example. The establishment of these large datasets as the primary source of cognitive capital and political power, marks the birth of the meta data society.'[43] The meta data society creates large-scale and centralised entities with which individuals, communities and

43 *Metadata Society*, Matteo Pasquinelli, 2015. https://s3.amazonaws.com/arena-attachments/632933/3a14aaef986e0e1f-077f5172a03193c5.pdf

small to mid-sized companies cannot compete. This is not only due to inequities in access to vital resources, such as money and engineering talent, but also due to the valuable assets these entities possess through the massive amounts of data they glean from a combined network of sensors, machine learning and algorithmic processing.[44]

Nick Srnicek explores this factor extensively in his book *Platform Capitalism*, which describes the self-reinforcing nature of the data business model; namely, if you are successful, you always have the advantage over your competitors.[45] Alphabet, the now-parent company of Google, is a key example. Indeed, over the last decade, this phenomena has created five of the wealthiest companies in the world, often referred to as 'GAFAM' – Google, Apple, Facebook, Amazon and Microsoft. Their accumulation of wealth, knowledge and power has become so significant, particularly in the case of Google and Facebook, that it is extremely difficult to imagine a scenario, short of legal action or forced closure, that would knock these companies from their positions.

Google has the most users across a wide range of domains: search, email, browsing, maps, but also mobile (Android), video (YouTube) and, due to hundreds of acquisitions and mergers, an increasing number of domains, such as the home (Nest), the body (23andMe) and even the mind (DeepMind). Similarly, Facebook has two billion monthly users

44 'Sensors' is used as a term to encompass the sensors placed within our infrastructure; our public transport systems and roads, as well as the internet of things. 'Machine learning' is an interchangeable term with Artificial Intelligence. 'Algorithmic processing' is used here for a range of processing, analysing, scoring and automation processes that enable the use of that data.

45 Nick Srnicek, *Platform Capitalism* (Cambridge: Polity Press, 2017).

as of June 2017.[46] That means over a quarter of the world's population is using Facebook, or one of its other products, like WhatsApp, on a monthly basis. This creates unparalleled and privileged knowledge about who we are as people – individually, nationally, regionally and globally. It reveals what we like and how we are connected. It also acts as an ecosystem for thousands of apps and products, which are then built on and around it – whether that is Facebook as a form of identification, or Facebook as a source for scoring, profiling, targeting or matching people. Therefore, even if its popularity waned as a social networking platform, Facebook could still feasibly exist as an underlying infrastructure.

Originally, Google and Facebook's core missions were not to make money through advertising, which they do. Google's founding mission was to 'to organize the world's information and make it universally accessible and useful.' Its unofficial motto was 'Don't be evil', a phrase which appeared in the code of conduct page for employees and investors but was more recently removed. Facebook's motto was 'To give people the power to share and make the world more open and connected.' Technofixes fit neatly in the ethos of Silicon Valley companies. Many of their engineers, technologists and designers are themselves makers, fixers and problem-solvers. There is a general *can-do* attitude, and an almost altruistic mood amongst some. Yes, they are working in a company. But ultimately they are there to use their individual skills and privileges to solve the world's problems. Which it so happens, also generates vast profits.

46 Kathleen Chaykowski, 'Mark Zuckerberg: 2 billion users means "Facebook's responsibility is expanding"', *Forbes*, 27 June 2017, available at forbes.com/sites/kathleenchaykowski/2017/06/27/facebook-officially-hits-2-billion-users/#681ee4753708

Journalists, activists, tech-critics and academics have noted that one of the reasons such businesses have become so extraordinarily wealthy is that they have found new ways of doing business; finding loopholes, exploring legal grey zones, or, in some cases, simply working in communities where regulation is weak and enthusiasm is high for investment and low-cost solutions. This ranges from big technology companies such as Facebook and Apple utilising tax havens to avoid tax payments in the countries where they operate, to platforms whose business models depend on disrupting traditional sectors, minimising assets, commitments, staff and responsibilities, such as Uber. This way of doing business is combined with constant experimentation, testing, and the roll-out of technologies at a scale and speed that would not be possible under other circumstances. The work culture is one of permanent prototyping and focusing on being quick to market, an environment in which – thanks to lack of relevant regulation – the real world *is* the laboratory in which things are tested. Actions are often driven by profit margins, but behind this is a specific worldview.

Facebook and Google, for example, have received a fair amount of bad press and more recently some fines for avoiding taxes. Doing this has enabled them to create vast amounts of off-shore wealth as well as enormous cash reserves. Some of that money has been utilised to fund and invest in their own technofixes, suggesting that perhaps their tax avoidance is not driven purely by profits. On the contrary, evidence indicates that they do want to help the world with their profits, but they think they can do it differently, or rather better than the state. Facebook does this through philanthropy and the personal generosity of the Chan Zuckerberg Initiative. Google achieves it through its investments and prizes that support

'moonshot' projects, seeking to confront global challenges, such as overcoming finite resources through mining the moon, or as mentioned earlier, combating aging through what they call 'radical life extension'. Bill Gates uses his wealth through his foundation to help those living in poverty by working to combat malaria and population growth, as well as funding research on gene drives and geo-engineering. And PayPal billionaires Elon Musk and Peter Thiel have both turned to alternative ways of living – Musk to sustainable energy and multi-planetary living[47], and Thiel to 'sea-steading'– creating autonomous zones for living at sea through building platforms between and beyond national borders. These actions are reinforcements of their ethos and are essential investments, yet they also affect the kinds of solutions that are developed.

For example, the Bill and Melinda Gates Foundation invested over eleven million USD in 2014 for the development of a microchip the size of a Scrabble tile that can be embedded in a woman's body for up to 16 years to remotely control her fertility.[48] This initiative has been funded because of its potential for implementation in the 'developing world', with little discussion about the possible security, safety and domestic risks of introducing such a technology into various cultural, legal and social environments. Sadly, the only discussion that can be found about the reality of implementing a remote-controlled fertility chip for women can be

47 *Why Invest In Making Life Multi-Planetary?* Elon Musk, available at youtube.com/watch?v=7SECSxUbXTA

48 Dominic Basulto, 'This amazing remote-controlled contraceptive microchip you implant under your skin is the future of medicine', *Washington Post*, 17 July 2014, available at washingtonpost.com/news/innovations/wp/2014/07/17/this-amazing-remote-controlled-contraceptive-microchip-you-implant-under-your-skin-is-the-future-of-medicine/?utm_term=.98de931c44d5.

found on message boards on the internet – the content of which is dominated by misogynists and trolls. The problem is exacerbated by the fact that so many of the women's reproductive rights NGOs who might challenge the Gates Foundation over this investment receive funding from them for other initiatives and therefore cannot take the risk of challenging such a decision. The work of the Gates Foundation is not only generous, but arguably essential. However, its philanthropic position protects it from rigorous critique and debate. There is no space to ask the question in this case – just because we can, does it mean we should?

Industry 2.0 – Solving problems with data

As data-driven companies begin to reach maturity, in terms of finances, impact and reputation, we no longer see breakaway sectors disrupting monolithic businesses. Instead, we are seeing a gradual collaboration between old and new power houses.

Increasingly powerful and significant mergers, collaborations and partnerships are emerging between data-driven technology companies and the lower and higher levels of industries and governments. This is exemplified through new cross-sectoral collaborations, such as that between 23andMe and Pfizer.[49] 23andMe makes home-testing DNA kits that can be bought for low-cost on the high street. It is a Google-owned company run by Google co-founder Sergey Brin's ex-wife. In 2016, they sold data to Pfizer from 300,000 UK residents who had used a DNA self-testing kit, which Pfizer plans to use to develop new mental health drugs.

49 See Caroline Chen, '23andMe Turns Spit into Dollars in Deal with Pfizer', *Bloomberg*, 12 January 2015, available at hbloomberg.com/news/articles/2015-01-12/23andme-gives-pfizer-dna-data-as-startup-seeks-growth.

Mega-collaborations such as this one consolidate the power of extremely affluent corporate entities across sectors, combining the existing lobbying power of traditional industries, such as pharmaceuticals, with new industries that have an increasing revolving door with government.[50] When established companies such as Pfizer are 'super-charged' with the unparalleled data-driven abilities of a Google-owned company like 23andMe, it creates a powerful alliance that is almost impossible to challenge.

Speaking more broadly about the role of regulation and policy in controlling technological innovation, Sheila Jasanoff argues that technology already sets the rules by defining the boundaries of our behaviour. She writes: 'Modern technological systems rival legal constitutions in their power to order and govern society. Both enable and constrain basic human possibilities, and both establish rights and obligations among major social actors.'[51] She also looks at the difficult question of the responsibility of the technology providers and the insufficient nature of regulatory bodies and ethics review boards. Her book extensively critiques not only how these organisations function, but also how they are embedded with certain political prejudices, raising questions about who runs them, under what remit, and who picks up the cheque. Lastly, she looks at the shortcomings of legal and policy-making systems and how, due to the

50 See *The Intercept's* investigation, 'The Android Administration: Google's remarkably close relationship with the Obama Administration in Two Charts', available at theintercept.com/2016/04/22/googles-remarkably-close-relationship-with-the-obama-white-house-in-two-charts/. Peter Thiel was an advisor to US President Donald Trump, (theguardian.com/technology/2016/nov/11/peter-thiel-joins-donald-trump-transition-team) and the Digital Technology Office of the Italian government is led by a senior executive at Amazon on secondment (thelocal.it/20160211/top-amazon-executive-to-lead-italys-digital-drive).

51 Jasanoff.

complexity of the questions at hand, this job is often left to industry experts. Jasonoff notes, 'Technocrats argue, rule by experts is the only viable option, since all we want is to ensure that technologies function well, and engineering design and the assessment of technological risks are much too complicated to be left to ordinary people.'[52] With this context, she highlights a trend that technology companies are advocating for industry self-regulation by claiming that the questions that need to be addressed are simply too complex for non-experts.

Technology companies often claim that they are working on technologies for which there are not yet rules or regulations. Therefore, their lawyers calculate the potential financial cost of worst-case scenarios if something should go wrong in the future. In this model, there is little structure for considering ethical or moral issues, or exploring possible unintended consequences. Rather, decisions are based on cost-based calculations of a potential lawsuit, or the possible extent of damage to public relations and therefore 'user trust'. This kind of 'techno-anarchy', as articulated by Alan Drengson, is a '...philosophy of exuberant, youthful curiosity and self-centeredness. It is an expression of optimistic self-assertion and individual opportunism.'[53] In order to exist, techno-anarchy seeks an environment in which 'the fewer government regulations over technology and the marketplace, the better.'[54] It is built on the premise that '...the market alone will determine which technologies will prevail.'[55] This is an approach shared

52 Jasanoff.

53 Alan Drengson, 'Four Philosophies of Technology', *Philosophy Today*, vol. 26, no. 2/4, Summer, 1982. ,pp. 103–117.

54 Drengson.

55 Drengson.

by experts from those working in the finance sector to those working with algorithms; from those working on experimentation in geo-engineering to those working on self-regulation. Across sectors, calls for self-regulation and voluntary codes of conduct are common due to a combination of intellectual property concerns, market advantages and the fact that the technologies are just too complicated to be understood by anyone other than those developing them. Unfortunately, in some of these cases, such as within the financial industry and high-frequency trading, that has proven to be true of even the experts who have built the systems in the first-place.

Regulation is not completely ineffective; but it is unable to accommodate the rapid changes and emerging challenges of new technologies. Of course, regulators do respond to many innovations and efforts, using it to block significant acquisitions that would create traditional monopolies. For example, in the agricultural sector, Monsanto, most well known for its production and sale of seeds, proposed to sell its data-driven precision planting technologies to John Deere, most well known for its agricultural machinery, such as tractors. This was blocked by regulators in 2017, as it would have created a near-total monopoly – a 90% market share, eliminating competition and locking in farmers to their services.[56] Such anti-trust regulation is essential, but it cannot be used to combat the monopolisation of knowledge that creates exclusive market advantages for such companies. In 2013, for example, Monsanto (now owned by Bayer) bought a Silicon Valley start-up, the Climate Cooperation, for one billion dollars. The company collects detailed,

56 See David McLaughlin, 'Deere Deal for Monsanto's Precision Planting Opposed by US', *Bloomberg*, 31 August 2016, available at bloomberg.com/news/articles/2016-08-31/deere-deal-for-monsanto-s-precision-planting-opposed-by-u-s-isj365rw.

hyper-local data, to the field level, from apps farmers use to track weather conditions and agricultural yields. The platform then compares this locally-entered data with the data of other farmers, analyses it, and then feeds back information to each farmer on how climate affects crop yields.[57] Coming back to the exchange-of-data-for-service model outlined earlier, this example serves to show how it works in practice. Individual nodes – in this case farmers – collect accurate, comprehensive and consistent micro-data in return for predictive models. The centralised technology provider – in this case Monsanto – gets a detailed overview of climate, soil conditions and crop yield across vast areas of land in Brazil, the US and Canada, giving the corporation valuable knowledge about the agricultural sector, crop supplies, performance and climate of entire continents.

The model that enables more users to access more resources in exchange for guaranteed ease-of-use at low cost transforms ideas of ownership and access. In order for devices, machines and digital platforms to become increasingly cheap, efficient and, most importantly, 'smart', the difficult mechanical and data-processing work must be done centrally by the technology provider. This means that by design, hardware becomes inaccessible to those who own it and, in some cases, illegal to access or modify. Therefore, not only do users lack any meaningful access to the data they personally produce, they also cannot extract any value from it without the central node. Moreover, they purchase assets that they never *own*, but merely have *access to*. This is true of any number of products that make things cheap and easy to produce, store

57 See Ariel Schwartz, 'Why Monsanto Just Spent $1 Billion To Buy A Climate Data Company', *Fast Company*, 10 July 2013, available at fastcompany.com/3019387/why-monsanto-just-spent-1-billion-to-buy-a-climate-data-company

and transport, or that simply dematerialise things, such as e-book readers or digital music platforms.[58] This is also true of hardware that the owner may physically possess but cannot open, repurpose or fix. Think about the digitisation of cars or cameras.[59]

An extension of the agricultural examples above makes this point clearer. In 2017, John Deere changed the terms and conditions of their contracts with tractor owners, stating that it would be illegal for people to fix their own tractors, and at the same time impossible for them to sue John Deere for any losses if the relevant dealer couldn't fix the tractor immediately. This led to a call from farmers for 'right-to-repair' legislation and finally to farmers using hacked Ukrainian firmware to fix their now digitised and inflexible machines.[60] Whilst this story gives hope for the power of resistance and the resourcefulness of people to find hacks and work-arounds against the attempts to control their livelihoods, the inequity of the relationship remains. The situation is exacerbated in instances where the farmer is also using precision planting technologies. In these cases, the very fact of using the tractor to work in their field means that the farmer is also continuously working for the manufacturer – producing data on the local conditions for the central node to extract further value without compensating the farmer.

This unequal dynamic is driving the birth of some promising alternative models: decentralised systems

58 This is Cory Doctorow's central thesis in his book, *Information Doesn't Want To Be Free: Laws for the Internet Age*, (San Francisco: McSweeney's, 2014).

59 Aaron Perznowski and Jason Schultz, *The End of Ownership: Personal Property in the Digital Economy* (Boston: The MIT Press, 2016).

60 See Jason Koebler, 'Why American Farmers Are Hacking Their Tractors With Ukrainian Firmware', *Motherboard*, 21 March 2017, available at motherboard.vice.com/en_us/article/xykkkd/why-american-farmers-are-hacking-their-tractors-with-ukrainian-firmware

such as smart home technologies designed to rely on a home-based server as opposed to a centralised one; or platform cooperatives, where the workers own the company, such as taxi co-ops in the UK and the US. These models are still few and far between and have not yet proven themselves to be commercially viable, but the fact of there existence is an indication that there is a demand for different models to combat some of the inequities and imbalances of power between technology providers and the labour of their customers and users, which they depend upon.

Not-for-profit technofixes

It would be remiss to look at the enthusiastic application of technofixes by companies and governments – as well as alternative grassroots efforts to utilise data-driven technologies as technofixes – without also acknowledging the actions of the non-governmental sector. Much of the NGO or charity sector (whether funded by way of philanthropic or state-sponsored entities) also falls victim to the logic of data-driven technology problem-solving. In the rush to find fixes at low cost and at scale, the NGO community is often guilty of using technological solutions that solve one problem whilst creating another. In an effort to provide credit to citizens without bank accounts, economic empowerment and FinTech projects, such as the micro-credit platform Lenddo, are being rolled out at scale in Africa and Asia. They give individuals credit based on their use of the internet, such as their Facebook profile, their browsing history and geo-location data from their mobile phones. Some of these are non-profits and others are seen as social-enterprise hybrids, funded by foundations and governments. Providing credit based on personal data has serious implications not

only for privacy, but also, when exercised through platforms such as Facebook, it has the potential to reinforce disadvantage. If you are friends with people who have bad debt (as is often the case at the bottom of the so-called 'pyramid'), then you cannot get credit, thus potentially reinforcing the cycle of poverty. In addition, if you need economic assistance, yet you also have political opinions you wish to voice about the context in which you live, this could create a negative credit rating and therefore you may not feel like you can express them on social media. As such, this technological solution designed to address poverty by giving access to credit unintentionally creates a new problem – a kind of further marginalisation and greater barrier to access for some communities, as well as a kind of 'chilling effect' on free speech online.

This example points to a particular dynamic of problem-solving through technology: namely, that a kind of issue-blindness emerges. Those working on economic empowerment cannot see the political participation and social justice implications of their solutions – as in the micro-credit solutions above – or those working on women's health and population control, such as the Gates-funded fertility chip, cannot see the potential for manipulation and loss of control in patriarchal and inequitable societies. Both are guilty of thinking primarily about the technological potential to overcome a particular issue, but neither has successfully recognised the broader context of their deployment or considered the unintended consequences. Arguably, this is indicative of the problems of 'silo-ing' in issue-based work by the non-profit sector. If so, then such difficulties have been directly carried into the design of technofixes, with the potential for an equally devastating affect.

The push and pull of issue prioritisation and unintended consequences is something that civil

society may find hard to face in the case of data-driven technofixes. For example, while smart homes and smart cities could produce new efficiencies and have concrete environmental benefits (such as more efficient management of energy consumption), they also create a ubiquitous surveillance apparatus that undermines the privacy of domestic life. In doing so, each of these technologies introduced into the home for efficiency and savings also invites in intelligence agencies, law enforcement and businesses with commercial interests. Thus, even when we are being personally politically progressive – installing a 'Nest' or a 'Hive' smart home system to manage our energy consumption and home security (which from their very names ooze ideas of a home that is natural and safe) – we are opening up a new set of issues. As Wendy Chun states, 'The walls of the home, however are no longer secure, if they ever were: there is no shield from competition, for the twin forces of media and market compromise domestic 'protection'. Privatization is destroying the private, while also fostering state surveillance and security as house arrest.'[61]

At their best, these initiatives show a certain lack of awareness of the work of other sectors, such as a disconnect between environmental and civil liberties groups. At worst, they show that a kind of issue-prioritisation or issue-hierarchy negotiation may have already taken place. In the case of smart cities, for example, it may not be that environmentalists are not aware of the implications for civil liberties, rather that they have already decided they are simply not as important. When looking at emerging areas of data-driven technologies, we can foresee a possible clash between environmentalists and privacy and rights

61 Wendy Hui Kyong Chun, *Updating to Remain the Same: Habitual New Media* (Boston: The MIT Press, 2016).

advocates. Environmentalists may see the value of the dematerialisation of objects and the automisation of work, in that it can sometimes reduce human destruction of the environment. Yet dematerialisation is perhaps a false dream, as it can, in some cases, increase the need for energy rather than decrease it. By its very design it creates new issues for privacy and rights advocates who are concerned with the loss of autonomy and agency that comes with such technologies. What we need are solutions that combine poverty/rights fixes and human/environmental fixes, not one or the other.

Data-driven alternatives

It would be naive not to recognise that techno-fixes can be found anywhere and everywhere in part because they reflect a natural human desire to tinker and problem-solve – albeit with new tools and devices. In this light, even the work of some bottom-up, open-source enthusiasts and open data initiatives can be seen as technofixes.

If we are convinced that data-driven technologies have become indispensable, then surely we must embrace them by not just responding to what is made with a certain technocratic ideology in mind, but also by looking for alternatives and supporting initiatives that strive to do things differently. Alternative trajectories to the ones laid out by governments and large companies are not only possible, but are arising at various scales and in numerous sectors. Although the longevity of such grassroots efforts remains to be seen, their methods, strategies and affinities are worth considering on their own terms. Some of their built-in designs or ethos may lead to different ways of thinking about future initiatives. However, it must be said that grassroots organisations' often experimental

uses of data and technologies does not exempt them from many of the ethical questions posed above. Not least of all because they might bring in their own techno-solutionist approaches to problems, albeit from a non-profit perspective.

Over the last decade, grassroots, 'maker' communities, creative commons and open-source technology projects have been extremely important sites of innovation and inspiration, particularly in the case of technologies that try to solve social, political and environmental problems. The Open Source and Creative Commons movement have been particularly important in this context and have enabled important contributions to the field, such as OpenStreetMaps. Unfortunately, some of these initiatives have never advanced past proof of concept; some have simply become another data set for the same overarching system, and others are swept up by corporations or larger concerns as cheap methods for research and development. This means we need to ask new questions about their potential viability and impact in the shifting commercial environment. For many grassroots initiatives, the biggest barrier to getting off the ground is lack of scalability and sustainability, as they rarely have viable business models beyond a grant funding model. Even if this hurdle is cleared, they may not have the resources needed to mount viable alternatives to be able to compete with corporate research and development departments, with their armies of PhD-level engineers and technologists and endless resources for failing, pivoting and trying again.

Perhaps, the point of these projects – in the context of the current moment and the inequity of access to resources, knowledge and power – is to prove that there is another way. They show us that technologies that may have a negative impact in one

arena may be re-purposed and re-conceptualised for another one. Alternative technologies can be devised that do not try to reinvent the proverbial wheel, but instead build off of existing, populated systems. One such example is the Syrian Archive, which has archived over 600,000 videos, uploaded to YouTube by citizens documenting the Syrian conflict. The project is an independent, non-profit initiative conceived not only to capture this content for ongoing analysis and investigation – such as understanding who is playing what role in the conflict – but also to create a repository of this valuable data for truth and reconciliation processes when the conflict ends. More recently, the project has started to adapt and re-train existing technologies, such as freely available open-source facial recognition technologies. They have done this not to automise the process of recognising people in the videos, but instead to recognise weaponry and ammunition in order to understand who is selling arms to whom, and which types of weapons are being utilised. In doing so, they have repurposed two types of existing data-driven technologies – video-sharing platforms and facial recognition – for entirely different ends.

We need to generate new ideas like these, which are driven by non-commercial interests and are effectively replicable and scalable in ways that enable them to contribute to our understanding of and response to different issues. Lessons need to be extracted from such projects to show, even if only in principle, that there is another way of designing technological solutions to be both effective *and* ethical. Data-driven technologies can be used to meet some needs beyond the commercial, serving the interests of citizens not businesses. Similarly, efforts should be made to facilitate data-driven businesses that do have valuable and unique knowledge but could aid

the work of civil society to share this data – a kind of data philanthropy. Some have called for a 'data commons' and questions have been raised about the 'public-good' nature of data that is gathered by proprietary technology providers. In this vein, some activists and critics have even called for centralised platforms such as Facebook and Google to be nationalised.[62] Whilst this may be an extreme and unrealistic position, there is certainly a business case to be made for products and services that respect and honour concerns related to the value and control of data.

Some companies are now experimenting with services that increase the transparency of their user-data in order to counteract the depreciation of 'user trust'. Google is surprisingly advanced on this front, allowing users to look at a dashboard of the data that the company holds on them. Unfortunately, none of the analysis is visible and it is not clear how comprehensive it is. But it is an important first step toward data transparency for the user. Other companies, such as the non-profit organisation Mozilla, are working on concepts like 'lean data' – i.e. collecting only what they need – or incorporating concepts of 'privacy and security-by-design', meaning that these concerns are naturally built in to products at the development stage. Indeed, efforts need to be made to educate designers, technologists and engineers to more fully understand the contexts in which their designs are used and the impact they may have in the real world once they are implemented. This effort could begin at the educational level, ensuring that designers, technologists and engineers are taught not only to produce and create innovative and commercially viable technologies, but

62 Nick Srnicek, 'We need to nationalise Google, Facebook and Amazon. Here's why', *The Guardian*, 30 August 2017, available at theguardian.com/commentisfree/2017/aug/30/nationalise-google-facebook-amazon-data-monopoly-platform-public-interest

also responsible ones. It could also be introduced at the product-design level, to guarantee that the potential impacts of new technologies are considered at the concept stage, a kind of preconfigurative approach to design, as suggested by Design Studies scholar Cameron Tonkinwise.[63] Such factors could also be incorporated into the work of technology companies by hiring people with PhDs in philosophy and the humanities, not just engineering and computer science – a trend that has been increasing in the last few years as data-driven companies find themselves facing a plethora of complex social and ethical dilemmas.[64]

Whilst these efforts do not provide solutions to many of the concerns outlined above, they do help mitigate their impact. They demonstrate that there is a case to be made for good business practices, which could be used as a leverage for some technology providers. A comparison here can be made with the business sector's engagement with environmental issues: whilst corporate social-responsibility and green initiatives do not necessarily 'solve' environmental problems, they do at least acknowledge their relevance to society, putting some pressure on companies to act accordingly and enabling consumers to make informed choices.

A solution in search of a problem

The problem with many of the technofixes we have highlighted in this essay – data-driven or not – is that

63 Cameron Tonkinwise, 'Design Away' in *Design as Future-Making*, eds. Susan Yelavich and Barbara Adams (London: Bloomsbury, 2014).

64 See George Anders, 'That "Useless" Liberal Arts Degree Has Become Tech's Hottest Ticket', *Forbes*, 17 August 2015, available at www.forbes.com/sites/georgeanders/2015/07/29/liberal-arts-degree-tech/#4cbc4a41745d and Melissa Fellet, 'High tech needs humanities PhDs, say Silicon Valley entrepreneurs at Stanford conference', 12 May 2011, available at news.stanford.edu/news/2011/may/humanities-tech-conference-051211.html

they are often solutions to problems introduced by technologies in the first place. This way of thinking perpetually leads to technologies that are designed to solve problems introduced by other types of technologies – from the arguably banal to the debatably essential. To take two extremes: at the micro level, the international cosmetics company L'Oréal launched a censor- and internet-enabled hairbrush in 2017.[65] The hairbrush, called 'The Coach', measures the extent of damage done to hair by products and other devices and gives the user advice on improving his or her hair quality, creating an entirely new technology built to mitigate the damage done by previous products.

At the macro level, geo-engineering projects seek to develop technologies to counteract the impact of climate change. For instance, the cloud-brightening initiative, devised by a group of retired Silicon Valley engineers, proposes using technology to increase the density of clouds to reflect the sun's rays away from the ground.[66] Both examples demonstrate the application of data-driven technologies as feedback loops. It may seem like a stretch to compare management of personal hair deterioration with management of planetary climate deterioration, but doing so demonstrates the irony, or tragedy, respectively. Some technologies are arguably opportunistic whilst others are essential. Either way, they all raise the question of the role technology plays in how we got to the problem in the first place.

If we contemplate the impact of technofixes long enough – as Evgeny Morozov does in his book

65 See Matt Burgess, 'We've reached peak IoT. There's now a smart hairbrush', *Wired*, 4 January 2017, available at wired.co.uk/article/smart-hair-brush-loreal-withings

66 John Holden, 'Controversial Climate-Change Solution May Be In The Clouds', *TechCrunch*, 24 August 2015, available at techcrunch.com/2015/08/24/an-even-more-inconvenient-truth-about-climate-change/

critiquing the use of what he calls 'techno-solutionism' – we can begin to categorise their most common missteps and see their follies. Solutions such as remote or robotic care for the elderly introduce technofixes that avoid the root problem of an aging population. These 'fixes' neglect the underlying issue – that social services and families are not resourced well enough to deal with the problem, and certain countries have decided it is not a priority and have refused to invest in it. Other solutions are completely disproportionate to the challenge at hand, such as facial recognition as a form of ticketing for access to public transport, as proposed by the company Cubic in the UK.[67] Still others are marketed as cost-saving and efficient in times of austerity, such as predictive policing. Many have already been exemplified in this text – solutions that invite new problems, such as the Gates Foundation's fertility microchip; solutions that have unintended consequences, such as FinTech micro-credit; or solutions that have the potential to reinforce inequities and power struggles, such as pre-crime policing in Israel, and so on. Referring to the many pitfalls of techno-solutionism, Morozov states, 'It's not that solutions proposed are unlikely to work but that, in solving the "problem," solutionists twist it in such an ugly and unfamiliar way that, by the time it is "solved," the problem becomes something else entirely. Everyone is quick to celebrate victory, only no one remembers what the original solution sought to achieve.'[68]

67 'How facial recognition could replace train tickets', *BBC News*, 26 July 2017, available at bbc.com/news/av/technology-40676084/how-facial-recognition-could-replace-train-tickets

68 Morozov, *To Save Everything Click Here*, p. 47.

The Trade-offs of Technofixes

For all the challenges that technofixes present, even those who might critique them would also argue that we still need them. The truth is, in most cases, we both want them and don't want them. From disease-surveillance as a solution to keeping nations safe, to precision farming as a solution for increasing yields and reducing risks, to robotic and algorithmic care as a solution for an aging population – data-driven technologies are extending our capabilities at the individual, social, economic and environmental level. Citizens want the state to be able to protect them from an outbreak of SARS, but they don't want their social media feeds to be scanned for symptoms.[69] Farmers want to be able to predict their crop yields, but they don't want to lose control of their business.

69 See Michael J. Paul, Abeed Sarker, John S. Brownstein, Azadeh Nikfarjam, Matthew Scotch, Karen L. Smith and Graciela Gonzalez, *Social Media Mining for Public Health Monitoring and Surveillance*, presented at the Pacific Symposium on Biocomputing 2016, available at psb.stanford.edu/psb-online/proceedings/psb16/intro-smm.pdf

Carers want the elderly to be looked after, but they don't want to submit them to constant surveillance. Technofixes have the potential to solve some issues, which is why so many of them are in place today, but often they force us to choose between privacy and efficiency, or between control and access.

The technological systems embedded in our societies today are as pervasive as they are complex. The very nature of their positive intent – to fix the world's problems in cost-effective, scalable ways – makes them relatively difficult to criticise. In fact, in this context, it is very hard for serious critiques to gain traction without appearing technophobic, romantic or short-sighted. As this essay outlined at the beginning, the standard reaction to the potential of new technologies to solve problems is either one of blind enthusiasm or pessimistic denial, yet neither of these responses affects their design. Modern technologies are, of course, crucial to the development of our societies and can help us effectively tackle problems, yet if we don't develop tools to make informed choices about which technologies we want and don't want, and the risks they pose to us, then we can't use them to their fullest potential.

The hard part about critiquing new technologies is accepting that they are both solution and problem. They really do present both magic and loss. The lesson here, perhaps, is that there is an inherent dualism: they present *both* opportunities *and* challenges. In this sense, we may need first and foremost to develop more holistic critiques of them. We may need to move to a constructive critique that recognises that their implementation inevitably comes with a host of dilemmas, choices and trade-offs. That is not to say we should strike a neutral or passive middle-ground. Nor should we take the position that technologies are neutral, as some have done (e.g. 'guns are just

tools, it depends what you do with them'). On the contrary, we need to learn to read them within the context of the political and social moments they emerge from and acknowledge that the issues they present are not 'tech issues' but rather political, social and environmental ones that need to be approached from all angles.

A technically and politically–informed critique could help us ensure that technologies are deployed as effectively and cautiously as possible.[70] Both critics and civil society need to find ways of critiquing new technologies that accounts for their 'techno-structuralist' nature – that they emerge from structures of power, as Majid Tehranian described. From these power structures, the data-driven technologies we create will amplify our existing struggles and inequities. We need to track their implementation vigilantly: in some cases, it takes time for adverse effects to emerge; in other cases, they are immediately clear. As such, we need to continuously reflect on the technologies we use and their variations, observing how they take hold outside of the server-room and in the real world. Finding a robust yet accessible way to analyse the impact of technological decisions at the local, regional and global level is an essential step for civil society. There need to be tools for constructive critique that are grounded on solid political practice, which is essential if decisions about how our societies are formed are to be made partly by individuals, communities and civil society with different interests and motivations. Such a critical view needs to break new ground for reflection; most urgently, it must re-politicise the questions we asked

70 See, on this urgent need and its expression in contemporary political systems, Félix Guattari, 'Capital as the Integral of Power Formations', in *Soft Subversions: Texts and Interviews 1977–1985*, ed. Sylvère Lotringer, trans. by Chet Wiener and Emily Wittmann (Los Angeles: Semiotext(e), 2007).

about the technological solutions that dominate our contemporary landscape and we need to more closely examine the implications of even the smallest technofixes. Without this, ultimately our responses and solutions will always be limited.

Searching for solutions

The reflections outlined in this paper produce a series of questions and leave us with the feeling – as practitioners – that we should *do* something. The problem is that those who are fighting against the negative consequences of techno-fixes – practitioners, tech-activists, policy makers and critics – are looking for solutions to something that is still forming, as well as fast-moving and largely beyond their reach. This is literally the case in terms of access and transparency, with the working processes and assets of most data-driven companies tied up behind mountains of non-disclosure agreements and closely guarded as trade-secrets, and the machinations of some of the most impactful government data-driven projects closed as a matter of national security. In such a context, those reacting end up flying blind *and* trying to predict the future, two impossible tasks (even with the help of the data-driven technologies they are reacting to). The shifts society is witnessing are so vast that they challenge it at a structural level – laws and regulations, accountability and justice, rights and sovereignty around the world are all thrown into question. It will take time and a great deal of political will to adapt to these changes.

Policy is important, but it will not move quickly enough to solve some problems. Other problems will simply go unresolved due to the political power of the industries involved, no matter how strong the policy arguments are. In such contexts, those reacting

are left chipping away with endless complaints and possible patches to elastic problems that emerge with each and every development. There are, however, a set of promising initiatives emerging in the area of strategic litigation. The landmark case of Max Schrems – an Austrian student who took Facebook to the European Court of Justice over privacy issues and won – created a significant amount of policy, media and public attention. Strategic litigation cases do not always strive to win – although this is ideal – but they use litigation as a tool to bring awareness to companies, legislators and the public. The process of activism in this area requires tireless brainstorming, determination and energy, producing methods to continuously monitor developments, recognise problems and mitigate situations as they arise. This way of working – down in the weeds – means it is hard to step back and come up with responses that are not at best temporary and at worst futile.

Tackling challenges this complex requires work and time, and interrogating the scope and extent of the impact of data-driven technologies on our societies may be the best place to start. We need to take the necessary steps to properly understand the direction these changes are taking society and to form a multi-disciplinary response to those who are implementing these data-driven technofixes. We don't only need technologists to look at these questions, but also political scientists and philosophers – not just corporate lawyers but also human rights and environmental lawyers. A great deal of essential work has already been done by scholars, journalists, filmmakers, technologists and activists to reflect on the challenges raised by the rise of data-driven technologies. Some of these efforts also attempt to suggest solutions or ways forward, acting as a kind of antidote to the inevitable feeling of helplessness they

otherwise produce in their audience. The problem with many of the solutions proposed, from Evgeny Morozov's call for localised and sovereign technologies to Srnicek's world without work[71], is that even their most willing audiences may quickly start to see the holes in their solutions. Perhaps this is a problem of their own success: by the time most critics have argued convincingly that there is a significant problem, it is very difficult as an audience member or reader to believe that any solutions will work at all.

This essay is a kind of call to action to experts from different disciplines, and to techies and non-techies alike, to find different ways of thinking about data-driven technologies and how they change the way we live. It is a call to approach them with both enthusiasm and caution, to recognise them as both efficiency and madness and to see them as an integral part of broader politics, power dynamics and worldviews.

71 Nick Srnicek and Alex Williams, *Inventing the Future: Postcapitalism and a World Without Work*,(London: Verso, 2016)