Philosophy of Technology in the Digital Age

The datafication of the World, the *homo virtualis*, and the capacity of technological innovations to set the World free.

Prof.dr Vincent Blok MBA

Inaugural lecture upon taking up the position of Personal Professor of Philosophy of Technology and Responsible Innovation at Wageningen University & Research on 7 September 2023

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Esteemed Rector Magnificus, dear colleagues, students, family, and friends,

I will start my inaugural address by outlining the main argument of my lecture. First, I will identify the phenomenon that philosophers of technology research. This subject matter, in my view, consists not only of ethical issues that disruptive technologies raise but also of the disruption of the world in which we live and act by these technologies. I will illustrate this disruption by reflecting on the convergence of the physical and the virtual in the digital world, which is expected to change the way we live together. I propose that philosophers of technology should research new disruptive technologies and the digital world in which they are embedded in an integrated manner. Subsequently, I will ask how the emergence of digital technologies disrupts the world's design in the digital age. My hypothesis is that technological innovations themselves constitute the World in a non-anthropocentric and non-determinist manner. To make my case, I will first draw attention to the difference between technology and innovation and propose a philosophy of innovation. This will enable me to consider how innovation processes have an economic, social-political *and* ontological impact on the world. Based on historical and contemporary examples, I will illustrate the redesign of the world in the digital age. This broader understanding of the impact of digital technologies will subsequently enable me to articulate some of the critical questions I have regarding digitalisation, and how the philosophical tradition can be made fruitful to critically reflect on the elision between the physical and the virtual in the digital age. This criticism informs my engagement with ethical questions in ethics of technology, ELSA (Ethical, Legal and Social Aspects) and Responsible Innovation. As a final step, I open a progressive perspective on the emancipatory potential of disruptive innovations to set the world free. In times of climate change, we are urgently in need of an emancipation of the World. We need to move beyond the classical opposition between *technophobia* and

technophilia and look for innovations that can set the World free and contribute to a sustainable future. I will illustrate the emancipatory potential of disruptive technological innovations by considering the shift from human-centred technology to bio-centred technology in biomimetic design.[1]

1. The convergence of the physical and the virtual in the digital age.
The digital revolution does not only involve the emergence of a new generation of radically new artefacts like sensors and robots but involves the disruption of the world in which we live and act. To explain what I have in mind, I will start with an example. The European Commission invests around 150 million euros in the development of a digital twin of planet Earth, called *Destination Earth*, or in short, *DestinE* (European Commission, 2023a). A digital twin can be defined as a real-time realistic digital model, replica or representation of a physical entity (Korenhof, Blok, Kloppenburg, 2022). As a digital twin, the ambition of *DestinE* is to be a one-to-one re-presentation of the physical Earth that can predict the effects of climate change and the impact of adaptation and mitigation strategies.

It is easy to imagine that *DestinE* constitutes a new virtual world next to the physical World we experience in our daily lives, just like the virtual world of games and social media. And yet, the digital revolution has a more profound impact than the constitution of a new *reality+* (Chalmers, 2022). Digital technologies like *DestinE* not only constitute a virtual world that can claim to be *real* but also disrupt the *physical* world in which we live and act. The example of DestinE makes this clear. If the ambition of DestinE is to "represent a real breakthrough in terms of accuracy, local detail, access-to-information speed and interactivity" (European Commission, 2023a), then the assumption is not only that the digital twin of planet Earth is data-driven, but also that the physical Earth itself is data-driven, fully accessible via algorithms and integrally re-presented by the digital twin.

On the one hand, a digital twin of planet Earth seems to change nothing at the physical level of the planet on which we live and act. At the same time, the Earth appears in a new way, namely as "rich observational datasets" (European Commission, 2023a). The 'accurate' one-to-one representation of the Earth system by *DestinE* does not so much combine the best of both worlds but presupposes the reconfiguration of the basic structure

1 This lecture is composed based on the various research projects I have worked on over the years, and in collaboration with my team of PhD students and post-docs. In the text, I refer to the sources from which parts of the line of reasoning were taken. These sources provide more argumentation for some of the claims I make here. I would like to thank Bart Gremmen, Jochem Zwier, Giorgios Tsagdis and Hao Wang for their feedback on earlier drafts.

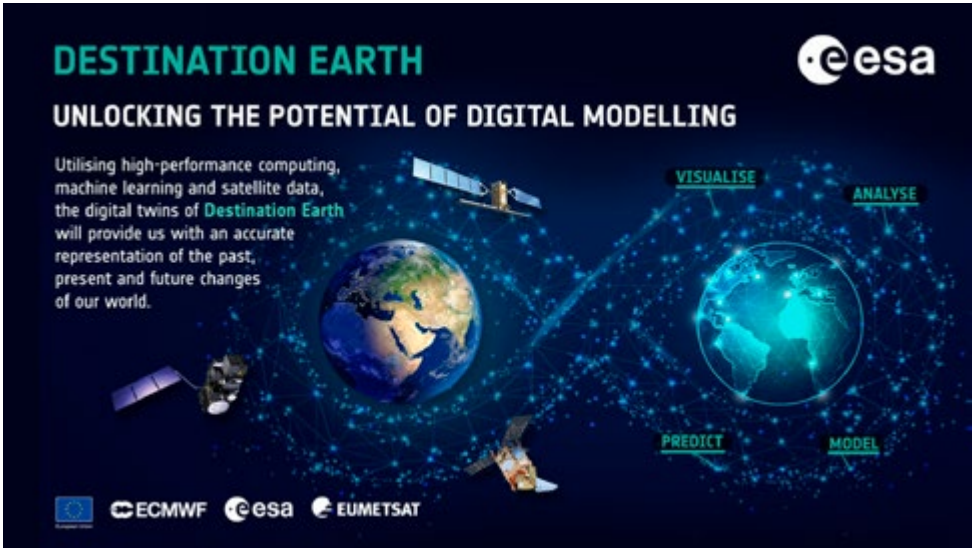

Figure 1. Destination Earth (Source: European Space Agency ESA)

of our understanding of the World as a whole, namely as a data-driven. In this redesign of the World, the physical and the virtual increasingly fuse. Only because of this fusion, *DestinE* can claim to be an 'accurate' 'one-to-one' 're-presentation' of the physical Earth, can claim to be able to predict the real impact of climate change on the Earth system, based on digital models, and can claim to test solutions to address climate change virtually before new mitigation and adaptation strategies are established in practice. In this regard, a digital twin of planet Earth is not merely a passive representation but actually impacts the World in which we live and act.

I speak about a World of data with capital W, meaning that data is not so much a characteristic of physical entities we encounter in the world, like the colour of my jacket or the material the chair in front of me is made from, but rather concerns a meta-physical structure that characterises the whole of being as computational information, affecting the meaning of my human existence and acting out in the world. This World of data supports the functioning of digital devices like digital twins that adapt the environment of the device to their functioning; for example, a digital twin of the human immune system or planet Earth is dependent on data for its functioning and at the same time, the digital device adapts the physical immune system or the Earth system *as* a dataset to its

functioning in order to accurately re-present the original.[2] While in the past, the World consisted of relatively stable and discrete substances or objects, with the emergence of digital technologies, a new coherence of the World emerged, in which humans and animals, plants and artefacts become homogeneously mobilised digital objects that are interconnected and interdependent in the internet of things.

Philosophers are particularly interested in these types of meta-physical shifts in which the sense or meaning of the same thing appears in a completely new way. They are thus called to radically reflect on the ontology of the World situation today – our living and acting in the digital World - and on the impact of the digitalisation of the World – the idea that beings in the world are interconnected by data flows and that anything, human and animal, plant and artefact, consists in computational data - on the human condition and its environment.
In my reflection on the World situation today, I can no longer a priori play off the everyday life experience of human and social reality against the digital World of data, as was common in the philosophical tradition of the 20th century. Classical phenomenologists would argue that the human immune system does not appear as dataset but as human living and acting in the World. It only appears as sense data from the quasi-mechanical perspective of cognitivism, i.e., the idea that cognition is a process in which sense data is perceived and processed to form representations that trigger behavioural responses. Although I am an heir of the phenomenological tradition, I cannot content myself with such a thesis, as the use of social media, E-books, and AI-driven helpdesks shows that digital technologies mediate my everyday experience. With this, I don't want to imply that I don't see a human across the street or a cow in the meadow anymore, but that my everyday life experience is nowadays mediated by the World of data. I cannot dismiss the World of data as un-world, as a *lack* of World in the digital age, as philosophers like Nancy would argue (2007), but have to take the *phenomenon* of the World of data seriously if I am interested in the ontology of the World situation today and want to reflect on the human condition and its environment in the digital age.

2. Empirically informed philosophy of the digital World.
In order to position my research in contemporary debates, it may be good to remark that many philosophers of technology are reluctant to raise these types of questions. They

2 This idea is inspired by an ontological reading of the work of Gilbert Simondon (2017). Simondon himself is primarily interested in the mechanology of the technological evolution in which technical objects emerge and evolve in their associated milieu like the natural environment or the laboratory at an ontic level, while I further develop this idea towards an ontology of innovation in which technical objects emerge and co-evolve with the World as a whole, while conditioned by the Earth as material condition of possibility of every World (Blok, 2022a). I will come back to this.

oppose previous generations of philosophers, like Martin Heidegger and Jacques Ellul, who tended to abstract from concrete technologies and to conceptualise underlying structures that govern the technological World, for instance, the technologisation of the world as a reservoir of resources that is present for exploitation (Heidegger, 2000), as total mobilisation of reality (Jünger, 1981) or as instrumental rationalisation of social life (Ellul, 1964). Do I not commit to the same type of abstraction in the previous section? Should I not instead engage in an empirical turn in the philosophy of technology and focus on individual artefacts like Chat GPT and AI-driven decision support systems, also because precisely these types of new technologies raise ethical concerns?

On the one hand, I agree with this criticism and believe that empirically informed philosophy is important to enrich the philosophical debate. This is why I engage in interdisciplinary research as well, as will become clear later. On the other hand, philosophers run the risk of throwing the baby out with the bathwater, if they neglect the questions regarding digitalisation I introduced in the previous section. The digital revolution does not only involve the emergence of new technologies like chat GPT and smart cameras. It also involves the growing together of the physical faces I encounter in the world and their digital idealisation due to the manipulation of face images, or the growing together of human intelligence (HI) and artificial intelligence (AI), as AI functions as a model for brain research and the biological brain inspires the design of AI. What is more, and more radically, the digital revolution involves the emergence of a new World of data in which the physical and the virtual increasingly fuse. Concrete digital technologies like digital biomedicine and AI can only function in a context, milieu or World of data as the substrate for algorithmic computation, and it is this context that raises societal concerns. It raises the question of how this new World of data impacts our daily lives and our understanding of the human condition. If we, for instance, look for responsible and trustworthy AI in food production, it is insufficient to solely look for the integration of values like fairness and privacy in the design, as society has also broader concerns like industrialisation, instrumentalisation and commodification of the agricultural sector. We shouldn't neglect these types of concerns, and this requires philosophical reflection on the digital World.

I am critical therefore of the one-sided orientation of classical philosophers of technology towards the underlying structure of the technical World, which overlooked the role of concrete disruptive innovations like digital twins, but also of the one-sided orientation of contemporary philosophers of technology who focus on concrete technologies like AI applications, ignoring the fact that digital technologies function in a World of data as the substrate for algorithmic computation. Instead, I try to integrate both perspectives (Blok, 2023d). In my research on disruptive technologies like digital twins, I, therefore, integrate

philosophical questions about the correlation between the physical and the virtual that is presupposed. Is there any certainty about the *adaequatio* of *DestinE*, or is this adequacy *produced* by digital technologies that adapt the physical to the virtual? Is there any limit to the digitalisation of the physical world, for instance, the physical world that must somehow *exist* for it to be adapted? What is the relation between the digitalisation of the Earth system in *DestinE* and phenomena like the instrumentalisation, industrialisation and commodification of the World?

Why is this important to consider? Compare it with a political discussion about societal challenges like obesity. A liberal will focus on individual factors to explain the phenomenon and will point to the individual responsibility of consumers. A socialist, on the contrary, will emphasise the structural factors that explain the phenomenon, like the role of the food industry in the stimulation of unhealthy consumption, or the structural inequality of vulnerable groups of consumers etc. In a similar vein, a liberal will identify privacy issues in the design of digital technologies and call for privacy by design approaches, while a socialist will emphasise structural factors like the fact that private human experiences become publicly available as commodities for economic exchange in times of surveillance capitalism (Zuboff, 2019). The focus on "technologies in their particularities" (Ihde, 2009: 21-22) attests to a liberal faith in technological progress that stresses the individual characteristics of particular technologies. These can be redesigned and enhanced by the designer to serve humanity. In contrast, structural characteristics like the datafication and instrumentalisation of the world in the digital age cannot be remedied by individual designers. Like a comprehensive societal debate about obesity should consider both the individual aspects *and* the structural inequalities involved, a proper philosophy of technology should integrate both concrete cases of disruptive technologies *and* the World in which they are embedded in an integrated way.

In my research, I, therefore, consider both the physical - the innovation process leading to the emergence of concrete new disruptive technologies like digital twins – and the meta-physical – the re-design of the structure of the world - in which concrete new disruptive technologies are embedded. This raises all kinds of methodological questions, such as how to engage with an empirical turn in the philosophy of technology, without committing to what can be called the descriptive bias of the analysis of concrete technologies and the way they mediate experience, thereby neglecting the function of these technologies in a World of data that is philosophically relevant. Since my dissertation in 2005 (Blok, 2005), I have written extensively about philosophical method and currently. I am working on the development of a methodology for the philosophy of technology to research both levels of analysis in an integrated manner (Bosschaert and Blok, 2023).

In this lecture, I don't want to concentrate on methodological questions and turn now to the question of how new and emerging technologies can impact the design of the World as a whole.

3. Innovation, technology and the role of the human

If I speak of a digital World in contrast to a previous era, where did this redesign of the World of data originate? To answer this question, it seems obvious to point at the human as the inventor of digital technologies. Does the digital World reveal humanity as a world-making power? It can be easily admitted that technology is decisive in the emergence of the digital World - without digital technologies, no digital World – but the self-evidence of technology as devised by humanity's creativity can be questioned (Blok, 2023d). Technological evolution has to be seen as determined by previous stages of development, interdependencies with other technological developments, as well as by intrinsic universal technical tendencies which are independent of humanity, but are operationalised in concrete technologies in relation to particular cultural and environmental settings (Simondon, 2017; Stiegler, 1998; Blok, 2022c). It can be argued, therefore, that the digital World we currently live in has been created by a succession of interrelated inventions. The human is not the primary subject of the creation of the digital World, as the human is rather *immersed* in the emergence of the digital World; like any other artefact in reality, a human is understood as a dataset in the World of data, for instance in his or her provision of unstructured datasets via social media posts, in his or her engagement in continuous feedback loops of real-time information with the digital twin of the human immune system in order to continuously learn and improve from both sides, or in its capacity to train Chat GPT by using it etc. If the human is *immersed* in the emergence of the digital World, it cannot be the *subject* of this emergence.[3] The emergence of the digital World involves a meta-physical shift of being and thinking at once. Inspired by the work of Ernst Jünger, this shift can be called a Gestalt switch, in which the structure of the digital World as a dataset, and at the same time, the human responsiveness to this World as a data processor, belong together (Blok, 2017a).

Because humans cannot be seen as the primary inventor of the digital World, I explore another hypothesis, namely the idea that technological innovation itself constitutes the digital World (Blok, 2023d). In order to explore this hypothesis, we first have to understand what innovation is.

3 The rejection of the human as the primary subject of the creation of the digital World does not imply that there is no room for human creativity anymore. I have developed elsewhere a concept of human creativity as deviation from the currently dominant World and responsiveness to new emerging Worlds that enables us to understand the human contribution to World-constitution (Blok, 2022d).

We tend to equate technology and innovation and to talk about technological innovation. This is commonplace, and philosophers tend to merge innovation and technology as well. Classical philosophers of technology like Heidegger never reflected on the notion of innovation, while contemporary philosophers use the term sporadically and only in connection with technology. There is, however, sufficient reason to dissociate innovation from technology. With technology, we think, in the first instance, about a product like a tool, machine, or artefact. But innovation is more than that. Innovation is both a process – the innovation process – and the innovative product that comes out of this process. We can say that all technologies are the product of an innovation process, but not all innovation processes produce new technologies. Social innovations or business model innovations can serve as examples of non-technological innovation outcomes. In the table below, I summarise five differences between technology and innovation.

Technology	Innovation
1) Product level as the point of departure (tool, machine, artefact) (for instance Mumford)	1) Process level as the point of departure (creative destruction)
2) All Technology is a Product of Innovation	2) Innovation doesn't necessarily produce new Technology (for instance social innovation)
3) Focus on intrinsic orientation (for instance Simondon, post-phenomenology)	3) Focus on extrinsic orientation (for instance economic embeddedness)
4) Technology as a rule-governed system (for instance Ellul)	4) Innovation as rule-creating and rule-destructing system
5) The known and familiar as point of departure (for instance Heidegger)	5) The un-known and un-familiar as a point of departure (focus on the New)

Table. 1. Differences between technology and innovation (Blok, 2021a).

Let us therefore have a closer look at the phenomenon of innovation itself.

Inspired by the work of Marx, economist Joseph Schumpeter conceives innovation as creative destruction (Schumpeter, 1983). In history, radically new-to-the-world innovations have been created for the first time, for instance, the first digital camera. However, the creation of new-to-the-world innovations extends beyond the artefact itself. The invention of the digital camera destroyed the industry of analogue cameras and the chemical industry around the development and printing of film rolls, leading to the bankruptcy of leading companies like Kodak, and created a completely new industry of digital cameras, photo editing, and storage programs etc. Such creative destruction involved in innovation proceeds, for Schumpeter, along temporary economic waves.

The creative destruction involved in innovation shows three other aspects of technological innovations that are missed by traditional philosophers. Jacques Ellul for instance argues that technology is an established rule-governed system of laws, rules and routines that we humans have to follow (Ellul, 1964), but innovation as creative destruction enables us to understand innovations as systematically rule-*creating* and rule-*destructing*. For Martin Heidegger, technology is that with which we are always already familiar. We already know how to use technologies like the pencil, the hammer etc. in our daily lives (Heidegger, 1993). But the concept of innovation as creative destruction takes the un-known and un-familiar of radical new-to-the-world innovations as a point of departure. Finally, Simondon argues that economic considerations do not contribute directly to technological evolution (Simondon, 2017), while innovation as creative destruction shows that technological innovations are inseparable from economic considerations. This is especially true in the digital age, where economic actors mobilise all human affairs in the process of economic exchange, not only as a production factor but also as a consumption factor (Stiegler, 2009). The economic dimension can therefore no longer be omitted in the contemporary philosophy of technology.

The concept of innovation enables me to move away from a static concept of technology as an artefact, outcome, or instrument and opens a new perspective for the philosophy of technology, as technologies have to be understood as new-to-the-world innovations. This new perspective enables me to consider the dynamic process of technological inventions and their evolution, the external factors involved (i.e., economics), and above all, their role in the constitution of the World.

4. The role of technological innovation in World constitution

The idea that new disruptive innovations lead to economic waves shows that technologies operate at two levels. First, technological innovations appear as radically new-to-the-world artefacts like the first steam engine or the first digital camera. At the economic level, these innovations destroyed existing markets and created new ones, for instance, the economic wave starting around 1845 associated with steam power and technological innovations in the railway industry.

Although Schumpeter provides an economic theory, the idea of economic waves can be extended to the redesign of the social-political world (Blok, 2023d). The invention of the steam engine gave rise to a new social-economic world in which the railway industry appeared. The steam train enabled people to travel from rural areas to city centres, as well as the transportation of raw materials to build industrial plants and mills to

produce the industrial societies in the wake of the Industrial Revolution, which required even more people to work in these factories. As a consequence, a new working class emerged who worked in the factories, and with this, unhealthy labour conditions and increased economic inequality (Figes, 2019). This example illustrates that innovations are insufficiently understood if we look at them only at the level of a novel artefact, because they also impact the social-political world we live in, disrupt human values etc.

Until now, however, I have only discussed the impact of technological innovations on the economic and socio-political world, which is also researched by historians and Science and Technology Studies (STS) scholars for instance. I did not yet indicate the ontological impact of technological innovations on the basic structure of reality that philosophers are also interested in. The example of the telescope can make clear what such an ontological impact entails.

The invention and use of the telescope extended for the first time the human senses to the universe beyond the world as we know it, which was inaccessible before. It opened up a new reality beyond our everyday world. At the same time, however, it disrupted our relation to the world as it destroyed the geocentric orientation – the idea that the Earth is the centre of the universe - and replaced it with a heliocentric orientation. The Earth no longer appears as the Earth on which we live and act, but from now on, it appears as a planet among the other planets in an infinite and unified universe, to which the same universal laws of nature apply (Koyré, 1958). Thanks to the technical mediation of the telescope, the universe became accessible with the same amount of certainty as ordinary sense perception, which was previously only accessible in speculation and imagination (Arendt, 1958). At the same time, thanks to the technical mediation of the telescope, humans became astral as they found a new Archimedean point in the universe outside the world, a new secure starting point on which our knowledge of the world can be based. It constituted a new orientation for human existence as if humanity manages and controls the planet from the outside.

What this example makes clear is that disruptive innovations like the telescope contributed to the destruction of the geocentric World and to the creation of the heliocentric World. With this, I don't deny that there is a gradual history of technological evolution at stake in the emergence and evolution of the telescope with multiple interdependencies, but in this history, a *qualitative* shift of and emergence of the heliocentric World is constituted as well. I talk about the constitution of the heliocentric World by the telescope, as it changed nothing at the level of humans and beings in the world, but at the same time, the meaning

or identity of the World changed completely as the Earth is no longer the centre of the universe, but a planet whizzing through space.

It is clear that we cannot think of the ontological impact of the telescope on the World as a causal relation. The example of the invention of the mechanical clock that increasingly replaced elemental clocks can make this clear. While time is circular in elemental clocks and oriented on the cyclical movements of the sun or plant life cycles, for instance, time appears as linear in mechanical clocks. On the one hand, the invention of the mechanical clock is *grounded* in our understanding of time as linear chronological time. Only if time appears and is understood *as* linear chronological time, does it make sense to invent an artefact that counts intervals of time. On the other hand, the invention of the mechanical clock *founds* this shift in our understanding of time, to the extent that the mechanical clock destructs the World in which time is cyclical and constructs a new World in which time is linear chronological. The constitution of this new World does not happen with the first invention of the mechanical clock, but is founded on the invention, dissemination, and use of the mechanical clock and of accompanying phenomena like calendars, forecasting etc. In this founding of the World, in which time appears as linear chronological, our understanding of the temporality of human existence changes. In the linear chronological World, a human being is understood as a non-cyclical, irreversible process along an axis running from a past to a future (Jünger, 1979). The ontological impact of the innovation of the mechanical clock concerns being and thing at once.

5. The philosophy of innovation

Before I continue my reflection on the impact of disruptive innovations on the constitution of the World in the digital age, I take a step back and draw conclusions regarding the earlier question 'What is innovation?'. Based on the reflections on the ontological impact of disruptive innovations in the previous section, I propose a framework for a philosophy of innovation. Such a philosophy does not only consider new disruptive technologies as an outcome of the innovation process, as is called for by the empirical turn in the philosophy of technology, but also the process in which these new-to-the-world innovations emerge and evolve. This innovation perspective on technology enables us to move away from a static concept of technology and to engage in a processual turn that considers the dynamics of technological inventions and their evolution. Moreover, the innovation perspective on technologies enables us to consider the ontological impact of the innovation process and outcome on the World in which they appear and on which their functioning depends.

The innovation perspective enables philosophers of technology to move away from the one-sided focus on new disruptive technologies at an ontic level of new artefacts, machines, and tools, and to engage with the ontological turn that is required to consider how these technologies ground in and found the World in which they are embedded.[4]

At the level of the innovation outcome, we can consider the innovation of the telescope for instance. These innovation outcomes are the socially disruptive technologies which are new to the world, but, at the same time, they are the output of a process of technological evolution through which they emerge as new-to-the-world artefacts. Galileo for instance didn't invent the telescope himself, but further developed the early refraction telescope invented by Hans Lipperhey. At the same time, the invention and evolution of the telescope have ontological implications to the extent that it impacts our basic understanding of the World as a heliocentric World and ourselves as astral beings in this World. The heliocentric World is not of all times but emerged through a process of creative destruction, in which the geocentric World was destroyed to make place for the heliocentric World. In the table below, four dimensions of innovation are distinguished that open a new perspective for philosophy of technology, and that acknowledge the importance of the empirical turn, the processual turn and the ontological turn in contemporary debates.

	Ontic level	**Ontological Level**
Innovation Outcome	New Socially disruptive technologies	World-constitution
Innovation Process	Ontogenetic process of emergence and evolution	Ontogenetic process of creative destruction of World

Table 2. Four Dimensions of the Phenomenon of Innovation (derived from Blok, 2021a)

4 Because notions like creation and destruction might still be understood as human categories, while I advance a non-anthropocentric, but rather a techno-centric concept of innovation, I proposed a materialistic conceptualisation of the creation process involved in innovation (Blok, 2022c). This doesn't mean that the creative destruction involved in innovation is comparable with or even derived from thermodynamics and has to be understood in terms of negentropy (creation) and entropy (destruction). As thermodynamics is primarily a theory in physics, at least, the risk is that our conceptuality remains solely oriented towards physical phenomena in the world. For this reason, I have proposed a meta-physical perspective on the process of creative destruction of the World as responsive conativity of material entities; all material entities tend to articulate a self or identity in contrast with the environment, and at the same time, they are responsive to this environment in their self-constitution (Blok, 2022c). The responsive conativity of all material entities, including human beings, also provides an entry point to understand the role of human creativity, namely as deviation from the existing World in order to become responsive to new affordances in the technical environment that constitutes a new World (Blok, 2022d).

6. The ontology of the World situation today: the constitution of the virtual World of data in the digital age.

Like the invention, evolution, and adoption of the telescope and the mechanical clock, the digital revolution today disrupts the World in which we live and act. In the digital age, we do not so much encounter singular inventions like the telescope, but a range of interconnected and interdependent technologies like sensors to collect data, data processing, sequencing and modelling techniques etc., that inform interconnected technological ecosystems like *DestinE* (see figure 2).

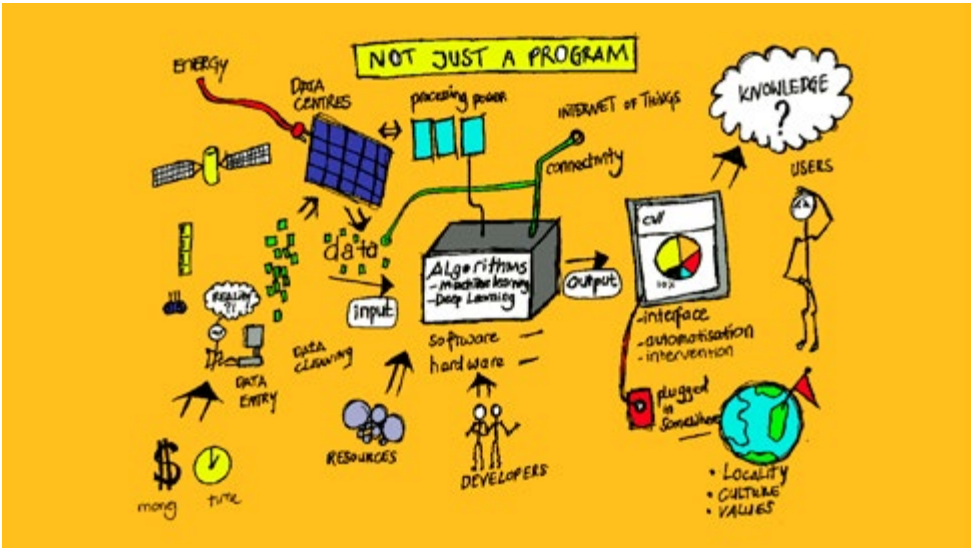

Figure 2: Artist impression of technological ecosystems in the digital age, by Paulan Korenhof.

The plant and the cow, the human and the planet appear today as rich datasets, for instance in *DestinE* or projects that aim to sequence the bio genome of all known species that can be found on planet Earth. On the one hand, such technological ecosystems, but also specific applications like ChatGPT or AI image generators, are grounded in the World of data that provides multiple datasets, like books, ecosystems, and artworks, including the human as dataset that provides feedback to the model and is in this way incorporated in the training process. On the other hand, these digital technologies found the World of data by adapting artworks, books, human intelligence etc. to the functioning of the digital device; ChatGPT is dependent on data for its functioning and adapts human intelligence *as* a dataset to its functioning in order to incorporate the feedback in the training of the model, resulting in the mutual alignment of the model and the human interaction with it. Examples can be found in

the circularity between the physical faces, behaviour, and bodily shapes that provide data for the design of the idealised versions we find on the Internet and in movies, which become in turn the measure and norm for the redesign of physical faces, bodily shapes etc. via make-up, bodily training, and plastic surgery, and results in the alignment, convergence, or even conflation between the two. The same can be said about physical artworks, literature and poetry that provide data for the design of artificial poems and artworks, that become in turn the measure and norm for what a good poem or work of art actually is. This adaptation of the World *as* a dataset for algorithmic computation extends beyond individual applications like social media, *DestinE* or ChatGPT, but concerns the whole of being in the digital age.

This World of data is not of all times but emerged in the course of history as a qualitative new structure of reality due to the innovation, evolution, and adoption of digital technologies. While in previous times the World consisted of relatively stable and discrete substances or natural objects that were structured by dichotomies like physical versus virtual, natural versus technological, and human versus non-human, in the digital age these dichotomies erode in the homogeneity and mobility of data as a substrate of all material entities we encounter in the world, whether as a substrate of biochemical or electric algorithms, or as a substrate of human or artificial intelligence.

The shift from the World as a discrete dichotomous set of substances to the World as a homogeneous and mobile dataset does not happen overnight. There is a circularity at stake between the grounding in and founding of the World of data. The invention of digital technologies like ChatGPT is on the one hand grounded in the World of data, as their functioning presupposes reality as a dataset. At the same time, it is only by the establishment and dissemination of these technologies in the world, that the World of data is founded. Through the circularity between the founding of the World of data by digital technologies and their grounding in this World, the World of data and digital technologies mutually align and constitute the World situation today (Blok, 2023d).[5]

5 I speak of a qualitative new structure of the World to indicate that the grounding and founding of the World of data emerges in history but cannot be reduced to a gradual historical process. I don't want to imply any progressive or regressive tendency in the emergence of a new World. The particular understanding of history that fits the emergence of the World in World history is up to future research. The notion of *DestinE* can already give an indication in the right direction for future research, as it raises the question of what is meant by the destination, the destiny at stake in *DestinE*. If a digital twin like *DestinE* consists in a continuous process of feedback between the physical Earth and the digital twin of the Earth, then this destiny is not something given upfront but only destined in the circular movement between the physical Earth and the twin, in which they grow together, align and conflate in the end.

This situation is characterised by the *virtuality* of the World of data, in contrast with the materiality of substances or objects in previous times. This becomes clear if we consider that in this new World, it is hard to distinguish between offline and online realities, as was still possible in twentieth-century science fiction movies like The Matrix, in which the virtual world of the Matrix still remained embedded in a physical world in which the human provided the energy to run the system. In the process of the datafication of the World, data becomes a new meta-physical principle of the virtual World in contrast to the material substantiality of the World in previous times. What is at stake in this process, is not a blending of the physical and virtual, but a transformation of the World into an ecosystem or datasphere in which "the question of substance proves bankrupt" (Hui, 2012: 394) and in which there seems to be no room for the acknowledgement of the materiality of physical objects (Bostrom, 2013), leading to an im-materialist philosophical position. Everything is relationally understood as an interconnected and interdependent *relation* in the Internet of Things. It is in this way, that the fusion of online and offline in today's world is no longer science fiction.

This transformation of the World as data not only concerns beings in the world but also shifts our understanding of the identity of human existence. Human categories like the spatiality and temporality of our living and acting in the World change, as we seem to be no longer dependent on physical proximity, location, and embodiment for our existence. My natural voice is for instance no longer dependent on embodiment, as a digital clone can digitally compensate for the internal vibrations and resonances in my chest, and video meeting software and social media make physical proximity and location irrelevant. These developments are not exclusively negative, as digital technologies can also compensate for bodily hindrances of disabled people who are now able to live and act in the World of data, just like any other person.

The transformation of the human identity in the virtual World goes further than the idea that social media constitute our identity. Not only is the human primarily a dataset like any other entity we encounter in the world. In the World of data, the human becomes primarily the data processor in this virtual world, the *homo virtualis*. For the *homo virtualis*, there is no room anymore for the singularity of human existence; data is never singular but always appears in a multiplicity, in which the pattern of data points is important. For the *homo virtualis*, the question "to be or not to be" becomes secondary. Data does not die. Rather, in the multitude of available data, the *relevance* of data, and its *utility* for computation purposes, becomes the key virtue. The virtue of relevance and utility is not intrinsic but has to be understood relationally as relevance *for others*. The virtue of the *homo virtualis* does not therefore consist in authentic existence, but existence is dependent on the

relevance and utility for others as processors of data. This explains the tendency of the *homo virtualis* to expose him or herself as the 'main character' in the World of data, continuously perfecting their 'story' on social media, supported by strong opinions shared on their platforms. As a consequence, for the *homo virtualis*, existence is only meaningful *within* the Internet of things.

7. Questioning the congruency of the physical and the digital in the digital World

It can be expected that theoretically, post-humanists and trans-humanists should embrace the World of data as I introduced it in the previous section. It supports their theory in which all classical dichotomies like human versus non-human or nature versus technology become fluid. In the virtual World of data, everything is relationally understood as interconnected and interdependent in the internet of things, including human existence, and makes human enhancement in a post-biological future possible. Although I agree with post-humanists that human life has to be understood in a relational way, I am critical about a conception of human existence as enmeshed in the Internet of Things in which every difference is flattened and it is no longer possible to distinguish between human and non-human, or between living organisms and artefacts (Rijsenbeek, Blok, Robaey, 2022). We are also in need of an asymmetry between our experience of the world and the world itself, in order to exist (Blok, 2021b). In order to acknowledge both the need for symmetry and asymmetry for human existence.[6]

Also regarding the erosion of dichotomies like physical versus virtual and human versus technology in favour of the homogeneity and mobility of data as a substrate of all material entities in the World, there is sufficient reason to be critical. First of all, if digital technologies like *DestinE*, techniques to sequence the bio genome of the Earth, or large language models like ChatGPT presuppose the World of data, in which the physical and the virtual converge, but this World of data is historically contingent, then it is possible to question the unconditional validity of this presupposition. The congruency between the physical and the virtual in the World of data is not a given but is grounded and founded by the innovation, evolution, and dissemination of disruptive technologies like *DestinE*, ChatGPT etc. With this, I question the assumption of digital physics that the universe *as such* consists of bits of data and that the physical Earth is the product of computation, the 'bit for it' postulation that every physical entity we encounter in the world is as such derived from bits (Wheeler, 2002); similarly, we can question the pan-computationalist assumption that the whole of being is the product of computation. I do not deny the reality

6 I have developed a dualist concept of materialism as a limit of post-humanism (Blok, 2023a).

of pan-computationalism as World situation today, but we should not take it as *naturally* given. It is through technical mediation, that the physical and the virtual, the human and the artificial etc. converge in the creative destruction of the World of data. With this, we also discover an argument against pan-computationalism, because the idea of *universal* computation fails to appreciate the history in which the World of data as a substrate for computation emerged. In the previous sections, I have shown that the historical process leading to the emergence of the World of data is not necessary to be understood in terms of the computation of data, but rather as an ontogenetic process of innovation in which the pan-computationalist World of data is creatively destructed (Blok, 2022c).

Second, if digital technologies *adapt* their environment as a condition for their functioning, for example, the adaptation of the physical immune system *as* a dataset for the functioning of the digital twin of the immune system, the nature of this adaptation enables us to question the assumption of an *a priori* congruency between the physical and the virtual. For instance, if the available dataset of planet Earth is limited, then the design of a digital twin implies that the physical Earth *conforms* to the twin. For instance, big data-driven technologies to prevent crime or AI-driven medicine not only assume the congruency of real-life criminals and healthcare patients on the one hand, and their digital representations on the other, but the digital representation of the criminal appear and guides my understanding of the real-life criminal without any concern about the adaptation of the physical agent to this digital representation. This guidance is not neutral but becomes the norm for my understanding of real patients and criminals to the extent that only the data of the criminal or the patient are taken into consideration, while everything that resists algorithmic computation, like qualitative aspects that cannot be captured in binary numeral systems, the spatial and temporal plurality of social-political systems, the constitution of meaning etc. is neglected as irrelevant.

The ambiguity between representation and adaptation by digital technologies comes to the fore in the use of 'emulation software'. Software engineers use emulation software to design a digital twin and argue that the twin is an emulation or imitation of the original. But *emulation* is an ambiguous term, as it is intended to indicate an imitation of the original, but comes from *aemulatio*, 'to strive to equal or excel in qualities or actions'.[7] The twin does not neutrally re-present the original but also rivals the original and, if successful, becomes the measure for the original. Notions like adaptation and emulation show already that the convergence between the physical and the digital that is presupposed by digital

7 See online etymological dictionary: https://www.etymonline.com/search?q=emulation (last accessed: 15-9-2023).

technologies is in fact limited by a principal difference between the two.

Third, if digital technologies emulate and rival the physical entity they represent, their adaptation of the environment in fact introduces a supplement or surplus beyond this original. Together with colleagues, I have shown that the relation between the physical entity and the digital twin is assumed to be a neutral and transparent re-presentation, but that the twin does not actually re-present the physical entity in a neutral way (Korenhof, Blok and Kloppenburg, 2022). The design of the digital twin involves *selection* processes, for instance, which data is seen as relevant in the big dataset that is available. This selection process is not neutral and might inform a *biased* twin. The design of the digital twin also involves *interpretation* processes which are dependent on the goals of the particular twin; *DestinE* for instance claims to be a representation of the Earth system as such, but as a European project, it primarily intends to serve the European policy agenda regarding sustainable growth (Korenhof, Blok and Kloppenburg, 2023). The design of the digital twin also involves the *translation* of a physical entity, ranging from a tomato to the Earth's bio genome in a digital representation. The design of the digital twin also involves the *application* of the virtual findings on real-life policymaking, impacting the physical World that is threatened by climate change. With this, it introduces a surplus or supplement to the original that principally differentiates between the two. Is that difference bridgeable as is often assumed, or is the difference between the two unsurmountable?

Many scientists working on digital technologies uncritically assume that their algorithmic computations have full access to the physical reality, without reflection on the convergence of the physical and the virtual in the World of data that has to be assumed prior to their operations. The same holds for many philosophers, who tend to neglect the fundamental differences between the physical and the virtual in their work and on the contrary, assume the convergence of the physical and the virtual as well. If Nick Bostrom for instance seriously considers the possibility that we are actually living in a computer simulation (Bostrom, 2013) or if David Chalmers argues that the virtual world can claim to be as *real* as the physical world (Chalmers, 2022), then the elision between the physical and the virtual World of data is already assumed and needs not to raise questions. Only if the physical and the virtual converge, we can no longer decide whether we are in the physical world or in a computer simulation of this physical world.

My critical reflections on the difference between the physical and the virtual in the World of data so far do not deny the *reality* of the increasing convergence of the physical and the virtual in the digital age, but question its assumed self-evidence. I can ask for instance for the origin of the congruency between digital technologies and the World of data. Is it

legitimate that the way I have access to reality via digital technologies dictates what I hold for real? The digital mediation of the planet conceptualises it a priori in epistemological terms, namely as a dataset. I can explore the incongruency between my experience of the world and the world itself, for instance by reflecting on the difference between the two that is indicated in the selection, interpretation, and translation processes involved.

To be sure, my critical questions do not criticise how digital technologies found the World of data and result in a hyperreality or hyper culture in which no room is left for the authenticity of human existence (Han, 2022), and do not call for the rehabilitation of authentic everyday life experience that is forgotten by these technologies. The world situation today *is* characterised by digital technologies that mediate my everyday experience, so there is no room to criticise the virtual World of data based on everyday experiences. The virtual World of data is *real*.

My criticism of the World of data is much more informed by the remaining difference between the physical and the virtual, the surplus or supplement that raises philosophical questions. For example, the digital twin of planet Earth or the human immune system involves a twofold principle: A as original and A1 as a supplement of the original that cannot be lifted by any twin. Why? *Sup-* means to add from the bottom up, so an addition (A1) to the original (A). This addition cannot be identical to the original. Otherwise, a sup-plement of the physical Earth would be neither necessary nor possible. The same holds for the twin as re-presentation and re-production of the original. *Re-* means 'again,' 'anew,' 'once more,' and therefore always involves a supplementary A1 in addition to the original A. In other words, this supplementarity shows that the foundation of the World of data by digital technologies always involves a remaining openness or difference between the physical Earth and the digital Earth that cannot be bridged (Blok, 2023b). It is important to philosophically reflect on the nature of this difference and the nature of operations like the selection, interpretations and translations that substantiate this difference.

It is especially the continental philosophical tradition that has always dealt with these types of questions. Philosophers like Derrida and Lacoue-Labarthe can help us to think about the relation between the original and the copy like the twin, and the nature of the principal difference between the physical and the virtual World. For example, while we tend to think about a digital twin in terms of an original entity which is present, and then is re-presented by the twin, Derrida's thinking about the writing of texts introduces a concept of supplementarity that no longer starts with the presence of the origin (Derrida, 1976). Inspired by Lacoue Labarthes' theory of the supplementarity of *mimesis* (Lacoue-

Labarthe 1989), we can for instance argue that there is no fixed, real original that can subsequently be represented by a digital twin. The Earth system is not something we can directly experience but is only accessible *via* its technological re-presentation. This technological re-presentation (*DestinE*) makes the original (the physical Earth system) accessible for the first time. We can then engage in a 'structuralist' understanding of digital twins, inspired by Ferdinand de Saussure (1998). Like linguistic signs do not so much derive their meaning from objects in the world but from their difference from other signs within the language system, the meaning of digital twins should not be conceived from the perspective of the original referent from which they are derived, but from the perspective of their difference from other twins within the World of data.

Although the argument that the twin makes the original accessible for the first time may sound counterintuitive, it is substantiated by the idea that the physical Earth is in fact a *terra incognita*. The ambitions of *DestinE* or the Earth's bio genome project presuppose that the physical Earth itself is fully accessible via algorithms and can be integrally re-presented by digital twins and digital models. The Earth is seen here as a spaceship or digital vehicle that can be steered and controlled by humans.

We can question this accessibility by considering that, first, the Earth systems' complexity might turn out to be non-computable in principle, or that the computer power currently available is insufficient to compute the complexity of the Earth system. Second, our knowledge of the Earth system is principally limited, as the Earth system is an eruptive, uncertain floating and wandering planet that always potentially disrupts the digital world and withdraws its management and control, as the term planet (*planetes*) suggests. Third, access to the Earth system is always mediated by the implicit or explicit selection, interpretation and translation principles that make the original Earth in the end inaccessible at an epistemological and ontological level. If this is the case then, it is only via a supplement like a digital twin that we have access to this origin while such a twin can never claim to re-present this original anymore. Instead, the twin constitutes this original for the first time.

If this is the case, the ambition of the digital twin to provide a perfect one-to-one re-presentation of the original turns out to be wrong right from the start. This doesn't necessarily mean that we have to reject the development of digital twins. It is these types of reflections, that enable us to question the self-evidence of the conflation of the physical and the virtual as World situation today and to reflect critically on the role of digital technologies in the constitution of the World of data today, as well as the role of the Earth as *terra incognita* in World constitution.

8. The need for a Terrestrial Turn in the philosophy of technology

The limits of the convergence between the physical and the digital can become concrete if we consider that digital technologies like digital twins and AI systems constitute the virtual World of data and are at the same still time dependent on the biosphere of the physical Earth for their functioning. The Earth is the location to source scarce materials to build the hardware and energy to run the software, provides the environment in which the required data centres can be built, functions as a dumping ground for waste materials and CO_2 emissions produced by these data centres etc. Every digital operation – whether it is sending an email or storing a photo, whether it is the training of ChatGPT or new data entries in a digital twin – consumes energy and externalises greenhouse gas emissions to the environment. This environment is not part of the virtual World of data, but the physical Earth as a condition of possibility of every digital World (Blok, 2023c).

Can the Earth as a condition of the possibility of the virtual World of data itself be digitalised? If digital technologies *adapt* their environment for their functioning and constitute the virtual World of data, as I have shown, and the physical Earth is the condition of possibility of every digital World, we encounter a limitation of the ability to adapt the environment. Digital technologies do not only adapt their environment to constitute the virtual World but are at the same time themselves *adaptive* to the Earth as a condition of possibility of every digital technology in the virtual World. This adaptivity of digital technologies shows that the Earth precedes these digital technologies and the virtual World they constitute, that the Earth is itself not part of this World of data; the scarce material resources to build the hardware, the availability of affordable energy to run the software and the networks, the relative stable climate to build the datacentres on etc. constitute the domain of planet Earth as condition of possibility of the innovation, evolution and dissemination of digital technologies that construe the virtual World of data, and these technologies are adaptive to these conditions.[8] I conceive the Earth as the literal inter-face, the common boundary of technologies and the World they adapt in order to function.

8 Although a philosopher like Simondon acknowledges the adaptivity of technologies, his conceptuality is still ambiguous in this respect. He argues that technologies adapt their external environment for their functioning, including environmental conditions like the river that is adapted as cooling instrument of the Guimbal turbine for instance (Simondon, 2017). I would argue that technologies indeed adapt their environment for their functioning – the animal, the cow, the human as data - but in order to do so, they have to be also adaptive to their environment for their functioning, namely adaptive to the available resources and the environment to build a data centre on, for instance. This environment of the Earth is the condition of possibility of every technology to adapt the environment for their functioning.

This distinction between the World in which we live and act, like the World of data, and the Earth as the material condition for all living and acting in the World, opens a new perspective on our living and acting in the World, as I have shown in a recently published book (Blok, 2022a). Although in the virtual World of data, everything is relationally understood as an interconnected and interdependent node in the internet of things, we cannot conclude that the relationality of digital objects replaced the material substantiality of objects, as some philosophers argue (Hui, 2012), or that everything is mental and that there is no substantial existence of digital objects, as mentalists argue. The Earth is the condition of possibility of every digital technology and of every adaptation of the World of data for its functioning as a digital object, which means that every digital technology is adaptive to this condition.

Quentin Meillassoux has criticised the philosophical tradition since Kant for its focus on reality as *correlated* with the way we humans have access to it. Phenomenologists like Husserl argue that we are *included* in the correlation between the way the world of positive facts is given to us (noema) and the subjective way of apprehending this world (*noesis*). As a consequence, it becomes impossible for him to say anything positive about the world *beyond* our relation to it, that is, about *un*-correlated being. Meillassoux criticises this correlationalist position because human living and acting in the world only appeared 4.3 billion years after the emergence of planet Earth in Earth's history, that is, the emergence of the correlation between being and thinking as a historical event is preceded by a long period of being *without* thinking, as un-correlated being. In contrast to the correlationist position, Meillassoux aims to rehabilitate the 'real' or what he calls, "the great outdoors, the eternal in-itself, whose being is indifferent to whether or not it is thought" (Meillassoux, 2013: 63).

Although I agree with Meillassoux's criticism of correlationism, and argue that claims about 'the bankruptcy of the question of substance' are not sot so much informed by the nature of digital objects, but by the correlationalist position that is inherited from Husserl, my rehabilitation of the 'real' comes to a different conclusion.[9] On the one hand, it is true that in the World of data, classical dichotomies like physical versus virtual and human versus non-human become fluid and everything is correlated as interconnected and interdependent in the internet of things. On the other hand, the technologies that constitute this correlated World of data still bear traces of the material and energy they are made from, the local conditions to which they are adaptive etc. This materiality of the Earth is

9 For a further discussion of Meillassoux' criticism, see Blok (2020: 102-118), and for my criticism of Meillassoux' conceptualisation of the Earth, see Blok (2020: 265-274).

not correlated, but rather un-correlated being and concerns the Earth system as an eruptive, uncertain floating and wandering planet that potentially disrupts the digital World and withdraws its management and control. This materiality can be observed in the material stubbornness or obstinacy of digital technologies that allow certain designs and do not allow others, in their resistance against interventions that can take their existence away, and in their capacity to remain a misfit in the ecosystem. I call this the Earth as a material *constraint* of the World in which everything is interconnected in the internet of things (Blok, 2023a). As such a constraint, we can consider the materiality of the Earth as a limit to the elision of the physical and the virtual in the World of data; the Earth limits the virtual World of data, prevents the virtual World from becoming a *hyper*-virtual, substrate-independent World in which there is no room for any material substantiality, as the structure of the virtual World remains *hypo*-virtual, i.e. constraint by the materiality of the Earth. In fact, the materiality of the Earth transcends – or better, *res*-cends (from res-matter, thing) - our living and acting in the virtual World of data, limits the erosion of classical dichotomies and the resulting immanence of digitalised objects in which there is no room anymore for any difference, and rehabilitates the Earth as source that limits the convergence between the physical and the virtual in the World of data.

With this, I don't want to rehabilitate a classical concept of the substantiality of the object in front of the subject. An ontology of the World situation today has to acknowledge both the structural aspect of the interconnectedness of our living and acting in the World of data *and* the materiality of the Earth as a pattern of constraints for each and every technology that constitutes the World.[10] A digital object is structured by the relationality that constitutes the World of data *and* is constrained by patterns of the materiality of the Earth.

The introduction of a dichotomy between Earth and World limits the flattening of dichotomies in the World of data and enables us to acknowledge both our interconnectedness and interdependency in the virtual World of data, as post-humanists argue for, and at the same time, leave room for a humanist position based on the materiality of human existence (Blok, 2021b).

In order to consider planet Earth as a constraint of the virtual World, philosophers of technology should engage in a material or terrestrial turn and reflect on the materiality of planet Earth as a condition of possibility of every digital technology that constitutes the World of data (Lemmens, Blok, Zwier, 2017). We should not only look at the way the

10 For the conceptualisation of the materiality of the Earth as uncorrelated being, see Blok (2020: 275-286).

invention, evolution, and dissemination of technologies constitute the World, but also at the way these inventions are responsive to the material condition of planet Earth, which constrains the structure of the World that is constituted by these technologies.

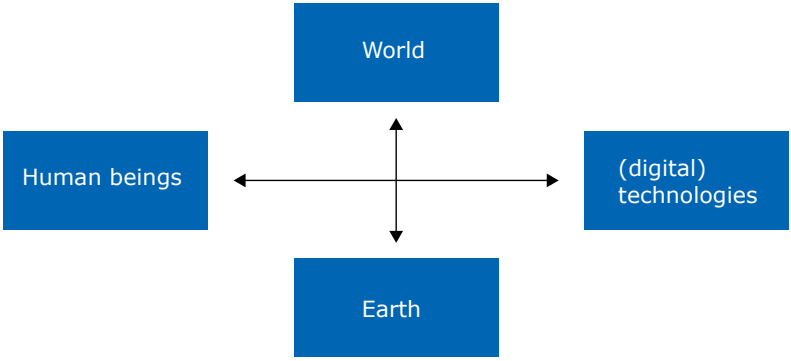

Figure 3: Schematic depiction of the dimensions of technologies that philosophers study.[11]

9. The human condition in the virtual World of data and the call for responsible innovation

We can also experience the limits of the convergence of the physical and the digital if we consider the difference between human intelligence (HI) and artificial intelligence (AI). In the open letter to pause giant AI experiments, signed by Big Tech representatives like Elon Musk, it is argued that "Contemporary AI systems are now becoming human-competitive at general tasks". Their question is: "Should we develop nonhuman minds that might eventually outnumber, outsmart, obsolete and replace us?".[12] If one argues that AI is still in its infancy, but one day it will be able to compete with and even outperform human intelligence, a principal homogeneity between HI and AI as a data-based algorithmic process of computation is presupposed.

Although we can be critical of AI because of its potential risks for society, as the open letter suggests, I concentrate on the convergence of HI and AI that is even stimulated by the open letter to pause AI. Such letters ripen the minds for a very narrow

11 These four dimensions can not be compared with Heidegger's notion of the Fourfold (das Geviert). The four dimensions of the Fourfold – Earth, sky, mortals, and divinities – constitute World according to Heidegger (Heidegger, 1994), while World is one dimension in my philosophy of technology. The further exploration of my conceptualisation of World in light of Heidegger's Fourfold is beyond the scope of this lecture.

12 Pause Giant AI Experiments: An Open Letter - Future of Life Institute (https://futureoflife.org/open-letter/pause-giant-ai-experiments/)(last accessed: 21-9-2023).

understanding of intelligence that can be applied in the domain of human *and* artificial intelligence as data processing algorithms in the virtual World. Here the same type of cross-fertilisation is at stake as I discussed earlier in the constitution of the digital World. On the one hand, it is Human Intelligence (HI) that inspires the production of and is the norm of artificial intelligence. It defines what intelligence means. But AI is also something that *happens to* us as intelligent beings, that transforms our understanding of human intelligence, for example as a data source for algorithmic computation, as an autonomous agent etc. In this way, the nature of AI as algorithmic data processing capacity tends to become the measure of what intelligence *as such* means. Only if intelligence *as such* is described narrowly in terms of data processing algorithms, human intelligence can one day be outperformed by artificial intelligence. But are we a data-processing machine? If human intelligence inspired the design of AI applications, and these digital artefacts become the measure of what the concept of intelligence as such means, basic concepts like agency, intelligence, and humanity are disrupted. On the one hand, such conceptual disruptions require fundamental research on the nature of the human condition, intelligence, etc.[13] On the other hand, this type of conceptual disruption leads to the critical question of whether human intelligence is actually something to be understood like AI.

I limit myself to just a few questions that can be raised. We can for instance raise questions about the different temporalities which are at stake in HI and AI. AI systems can interact with the world in the present, are trained by past data, and extrapolate towards the future. HI, on the contrary, is bound to an orientation on the future because of my mortality, a future death that never will become present as a data entry point. Another entry point for criticism concerns the different notions of rationality in HI and AI, as AI is limited to the instrumental, formal reasoning part of intelligence that can be captured by binary numeral systems, while human rationality involves also emotions, volition, and desires which are even opposed to instrumental rationality. In fact, we have principally limited knowledge about the nature of human intelligence, the workings of the brain, emotions etc., and this calls for a philosophical-anthropological perspective on AI as a new habitat for human intelligence in the digital World.

These differences between HI and AI also show why we have to extend the domain of ethics of technology and responsible innovation by engaging in fundamental philosophical

13 In a large NWO-funded program in the Netherlands, I study together with many colleagues at the Technical Universities in the Netherlands the ethics of socially disrupting technologies from the perspective of these types of conceptual disruptions: www.esdit.nl (last accessed: 22-9-2023).

research. Responsible Innovation focuses on the question of how social and ethical concerns can be identified and addressed in an early stage of technology development, how public concerns about the technology can be taken into account during the innovation process, and how scientists and engineers can develop a reflexive attitude to consider these types of questions. Responsible innovation should not only focus on ethical issues like privacy, discrimination, and welfare in digital technologies like facial recognition or milking robots. Societal resistance against these technologies is also informed by more profound concerns about surveillance capitalism, enslaving consumerism or the industrialisation of food production. Responsible innovation should not therefore be limited to the ethics of digital devices, but it should also integrate critical reflections on the convergence of the physical and the digital, on the instrumentalisation of humans and animals as data sources, and on the consequences for the human condition and the biosphere of planet Earth.

For example, in debates about the ethics of AI, there is a call for human-centred AI. The High-level Expert Group on Artificial Intelligence of the European Commission states: "AI systems need to be human-centric, resting on a commitment to their use in the service of humanity and the common good, with the goal of improving human welfare and freedom" (European Commission, 2019). Although it is important to integrate values like human welfare and freedom in AI design, it is questionable whether this strategy is sufficient as long as questions about the nature of data and the human condition are not addressed.

What are the differences between data and other resources like land, knowledge, and capital? If the value of data is always relationally understood in terms of its utility for computation purposes, what does this imply for the consideration of intrinsic ethical values like justice in AI design? If the value of data is temporal, as data can be stored forever while its relevance changes over time, what does this imply for our concept of responsibility? The value of data is not accumulative like land or capital, as big data-driven research can un-cover causal relations based on algorithms, but too much data can also obscure these relations in the plethora of data available. What does the World of data imply for our concept of truth?

Human-centred AI also raises anthropological questions. What do we mean that the human condition should be the centre of AI development? Is there one homogeneous understanding of the human condition, and can it account for social-cultural differences among people? In European policy, the aim of the European approach to AI is to boost research and industrial capacity. This means that human-centred AI implicitly conceives

the human as an economic agent in a free market (Ryan & Blok, 2023). If the human is primarily understood as an economic agent in a free market, and "people and businesses should be able to enjoy the benefits of AI while feeling safe and protected" (European Commission, 2023b), then human-centeredness is closely connected with the added value of AI applications for consumers. This added value is not intrinsic, as in ethical values like justice or freedom, but relative to consumer demands. If this is the case, then the ethical call for human-centred and trustworthy AI might already be contaminated by economic motives, which makes AI consumer-centred, rather than human-centred. If we consider the implicit conception of the human in human-centred AI from the perspective of the *homo virtualis* I introduced in the previous sections, then the *relevance* and *utility* of AI applications for others become the key virtue of human-centeredness. As I have shown, for the *homo virtualis*, not the singularity of human existence is relevant, but existence is only meaningful *within* the internet of things. What does this interconnectedness mean for the individualistic orientation of most European values, for instance, freedom as *personal* freedom?

Notwithstanding the popularity of the notion of human-centred AI in current ethics of AI debates, a philosophical anthropological perspective is largely absent (Stellinga, Blok, Korenhof, 2023). On the one hand, the implicit assumption of the human as *homo economicus* might explain the popularity of human-centred AI in the ethics of technology, as it provides the opportunity to align ethical values and economic values and serves the neoliberal agenda. On the other hand, because the call for human-centred AI is originally politically motivated, as AI should serve society, we can explore a political concept of human-centred AI that is able to inform responsible innovation and is embedded in the human condition as political *and* economic being (Schomberg and Blok, 2023). What will human-centred AI entail, if we see the human primarily as *zoon politikon* for instance? Then we are less interested in whether an AI application like ChatGPT serves consumer needs while respecting values like equality, but whether an AI application serves the plurality of voices in the public domain.

Fundamental philosophical questions in the ethics of technology do not only serve a critical goal. The implicit assumption of the human as *homo virtualis* can offer a progressive concept of bio-centred AI as well. The interconnectedness in the internet of things can help to criticise the anthropocentric orientation towards *human* values in human-centred AI and can inform a concept of bio-centred AI. The shift from human-centred to bio-centred AI is urgent, because current AI research often neglects the biosphere of planet Earth in general, and the enormous amount of energy that is required for the use of digital technologies and

the CO_2 emissions that accompanies its data processing activities in particular.[14] From a bio-centric perspective, human-centred AI might be even reconceptualised beyond the anthropocentric orientation: the biocentrism of AI can be served by human-centred AI, i.e., by prioritising the use of human intelligence where possible, as the use of HI involves less CO_2 emissions compared with the simplest computations by AI. These considerations of the human condition in human-centred AI show the importance of combining research in philosophical anthropology and ethics of technology to develop a fundamental philosophical concept of human-centred AI.

Although fundamental philosophical research is important, it is as important to connect these reflections with actual technological developments. To substantiate the empirical turn in the philosophy of technology, we can think of the development of an interdisciplinary ELSA laboratory to research the ethical, legal, and social aspects (ELSA) of AI. In such a laboratory, both the philosophical and ethical aspects of responsible AI can be researched. The idea behind ELSA labs is that concerns regarding ethical, legal, and social issues should be considered when digital technologies are still in the making and developers are still able to intervene in the design in order to make them ethically acceptable, socially desirable, and sustainable. In such an ELSA lab, we can develop, test, and apply a methodology for (re)designing technologies to make them more responsible.[15]

In ELSA lab research, digital technologies are not only considered as an object of responsible innovation. ELSA research on digital twins should for instance not only look at selection biases in the design of *DestinE*, but reflect on the societal purpose of *DestinE* beyond economic interests, and anticipate the climate impact of the design and maintenance of the device. A digital twin can also potentially serve as an ELSA tool itself, i.e., as a virtual experimentation space that enables a broad range of stakeholders to consider the ELSA and sustainability risks and consequences of proposed AI applications. In a similar vein, ELSA research can also adopt digital technologies, like virtual reality applications, to offer designers a first-person perspective of the ones who are subject to its application. This is especially important in the case of responsible innovation in the context of agriculture and food, as animals, contrary to artefacts, have a double ethical status and are not only the object of innovation but should also be considered as the subject of innovation (Gremmen, Blok, Bovenkerk, 2019).

14 With bio-centric AI, I do not mean that we reject human values in favour of ecological values. I reject both extreme anthropocentrism at the expense of the biosphere and biocentrism at the expense of human existence, as humans are relational beings. This means that the acknowledgement of human values already presupposes the acknowledgement of the ecosystem or the World in which he or she lives and acts, while the acknowledgement of ecological values already presupposes the acknowledgement of the human as an inhabitant of the ecosystem.

15 For more information about ELSA labs, see: www.AI4SFS.org (last accessed: 22-9-23).

10. The capacity of technological innovations to set the World free.

The exploration of the progressive use of digital technologies in ELSA research shows already that I am not necessarily pessimistic about the digital age, for instance, because no room is left for the authenticity of human existence, and do not see technology as the danger of our time. All technological innovations are creatively destructive, potentially destroying the existing World and constructing a new World. And this is important because we live in times of multiple crises, like the crisis of climate change, geopolitical conflicts like the war in Ukraine, and cultural shifts like the emergence of populism in the Western world. These crises make clear that the Anthropocene World of economic growth, material wealth, and technological progress since the Industrial Revolution has come to an end and calls for a post-Anthropocene – more sustainable - World (Blok, 2017b). We are at a turning point and urgently in need of new capacities to set the World free. On the one hand, this shows why it is important that philosophers reflect on the creative destruction of World and the role of technological innovations in this process. On the other, it shows why we have to conceive technology beyond the classical opposition between *technophobia* and *technophilia* and look for innovations that can actually set the World free and contribute to a sustainable future. Unfortunately, technological innovations that entrench the current exploitation of the biosphere of planet Earth are common; but we have to look for innovations that emancipate the World and contribute to a sustainable future.

Currently, for instance, sustainable technologies that aim to serve a bio-based or circular economy assume an intrinsic relation between technology and the free market. The economic orientation of these technologies limits the possibilities of a truly biobased economy, i.e., an economy that operates within the carrying capacity of the Earth (Veraart, Blok, Lemmens, 2023). In order to contribute to a sustainable future, it is not sufficient to be a Luddite and reject technology, or to be a technophile and embrace technology, but to study the relationship between the biosphere and the economic sphere in the biobased circular economy (Veraart and Blok, 2021a), the impact of economic thinking on the invention of digital technologies and the datafication of the World, and the need of a new political economy to contribute to a sustainable future (Blok, 2022b: 54-72). Philosophers like Levinas and Bataille can help to think about the relationship between the biosphere and the economic sphere, and about the consequences for the human condition as zero-waste (Zwier et al. 2015) or wasteful (Veraart and Blok, 2021b) humanity.

It is clear that these philosophers never turned their thinking to the context of the life sciences and to biobased technologies. But this should not mean that the empirical turn in the philosophy of technology consists in the Cartesian rejection of philosophical scholastics in favour of our empirical consultation of the book of nature. What contemporary

philosophers of technology should do is to advance philosophical theory by confronting theories from the philosophical tradition with today's World situation in order to advance both disciplinary philosophical and interdisciplinary debates.

I introduced for example the philosophical concept of Earth as a constraint of the structure of the World of data. First, this concept of Earth enables me to criticise philosophical theories, like Heidegger's concept of the technologisation of the world as a reservoir of resources that are present for exploitation in times of climate change. In times of climate change, the Earth no longer emerge as such a reservoir of resources, but as a condition of the possibility for our living and acting in the World (Thijs, Blok, Zwier, 2023). Second, the philosophical concept of Earth enables me to criticise theoretical accounts of digital twins. It can be argued, for instance, that currently, digital twins focus on the structural aspects of the World of data that are mimicked in the digital twin, while the patterns of constraints by the materiality of the Earth are ignored. These patterns of constraint can disrupt the World of data and withdraw its management and control and should be taken into account in digital twin design. This may open a progressive perspective on *sustainable* digital twins that considers both the material constraints and the structure of the World in its design. Third, it is possible that technological developments like digital twins can question our philosophical theories. For example, Simondon's philosophy of technology argues that we have to consider the technical object *in* its associated milieu (Simondon, 2017). New and emerging technologies like digital twins enable me to question this distinction between the technical object and its associated milieu, as the twin concerns both the artefact *and* its environment. Finally, it is possible that technological developments support new theoretical developments in philosophy. For example, a philosopher like Husserl is critical of the natural attitude of science that takes the reality of the world of facts for granted and calls attention to the correlation between the way the world of positive facts is given to us (*noema*) and the subjective way of apprehending this world (*noesis*)(Husserl, 2002; Blok, 2020: 33-55). In the World of data, such a natural attitude is no longer possible, as beings no longer appear as discrete substances, objects or facts, but are relationally understood as interconnected and interdependent in the internet of things. In the World of data, there is no room anymore for the fact-minded scientist that Husserl criticised, but science becomes relational itself, as is indicated in developments like quantum entanglement in contemporary physics. The World of data substantiates the transition from the onto-theological framework of traditional metaphysics, in which the Being of *beings* or *objects* is the point of departure, to a relational understanding of Being as such, as Heidegger calls for (Heidegger, 1983), the truth of Being as concealing-unconcealing of data.

The task of today's philosophy is not only to articulate today's World situation but also to critically destruct the assumptions that pre-structure the World of data – the conflation of

the physical and the virtual in the virtual World – to actively *diverge* from the converging tendency by our engagement in the experimentation with the emancipatory potential of new and emerging technologies to set the World free, in which a sustainable World can be envisioned and constituted. The critical hermeneutics of today's World in which we are at home, the destruction of the World situation today and the creative experimentation to set the Word free, characterise philosophical method as an Earthbound confrontation with the World of data (Blok, 2020).

An example of progressive research of the emancipatory potential of technological innovations can be found in the shift from human-centred technology to bio-centred technology. As human intelligence is already much broader than the narrow rationality of artificial intelligence, the same can be said of biological intelligence. Biological intelligence does not only consist of the processing of data from the environment by an organism because this organism is continuously modulating itself in the process of metabolism, in which it constitutes itself and is at the same time responsive to the environment. How does nature solve problems in the course of evolution, how do organisms collaborate in ecosystems, and what diversity in types of responses to the environment can be found in the natural environment? From this, we can learn that intelligence, rather than being merely the product of an individual actor like a human, emerges through multiple interactions of organisms with affordances in their ecosystems. Can we learn from and mimic natural intelligence in technological design? The emancipatory potential of technological innovations can be found in biomimetic technologies (Blok, 2017b) and requires an empirically informed philosophy of biomimicry to consider the conceptual and normative tensions in different types of biomimetic design (Gerola, Blok, Robaey, 2023).

A particular case of biomimetic design is artificial photosynthesis, the process of producing fuels from carbon dioxide using sunlight and water that mimics natural photosynthesis (Popa et al. 2023). If artificial photosynthesis turns out to be possible and scalable, it not only provides an example of regenerative sustainable design but potentially also a decentralised energy system as an alternative to the centralised energy systems that are dominated by private sector actors as we know them today.

Of course, technological developments since the Industrial Revolution can be seen as part of the problem of climate change. But by reconceptualising technology as biobased, mimicking the closed cycle loops of natural intelligence for instance, technological innovations can potentially set the World free and construct a new sustainable World in the future. Philosophy should engage with the sciences and look for alternative practices in order to envision these futures.

World of gratitude

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Disruptive technologies disrupt the World in which we live and act. My hypothesis is that technological innovations themselves constitute the World in a non-anthropocentric and non-determinist manner. This broader understanding of the impact of digital technologies raises critical questions regarding the converge of the physical and the virtual in the digital age. I end with a progressive perspective on the emancipatory potential of disruptive innovations to set the world free, as is needed in times of climate change.

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