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Engineered humans

Abstract

In what follows, I shall focus on what may be defined as the engineering of humans from a philosophical perspective. More precisely, I shall reflect upon the way in which our language increasingly changes when we define our relationship with emerging technologies, specifically human digital twins, which, as our technological replica, can serve as privileged standpoints to try to understand the meaning of the shift from using distinguishable words to define humans and technologies (for instance, when we happen to talk about our health in terms of self-perception) to using indistinguishable words to define humans and technologies (for instance, when we happen to talk about our health in terms of human digital twins' diagnoses and prognoses). The change of our language shows a kind of optimisation that is taken to the extreme, starting with the optimisation of human bodies' performances: the more engineered humans are (in that they identify their purpose not with feeling good, for instance, but with preforming in faster and more profitable ways), the better they are (in that they measure themselves not against typically human values, such as feeling good, for instance, but against typically engineering values, such as efficiency). But a remarkable paradox emerges, whose meaning shall be the core of my philosophical reflection: the more humans work on optimising themselves, the more they (paradoxically) work on moving optimisation from themselves, i.e. their capabilities as autonomous humans (starting with self-perception), to technologies, i.e. ways of engineering, specifically automating, themselves.

Keywords

Engineered self-perception, Engineered human identity, Human digital twins

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1. Introduction

“I went to the doctor, but he did not examine me at all”. How many times have we happened to say analogous words? Our answer is likely to be the following: “Too many times, and increasingly in the last years”. The issue at stake is complex, from touching on the bureaucratisation of medicine, specifically the doctor-patient relationship, to touching on the balance between public healthcare and private healthcare. In what follows, as a philosopher, I shall focus on something specific: what may be defined as the engineering of humans. Speaking of the engineering of humans means speaking of an equally complex issue at stake. Thus, in what follows, I shall necessarily select a circumscribed perspective, which is the following: the way in which our language increasingly changes when we define our relationship with emerging technologies, specifically human digital twins. For reasons I shall explain, human digital twins as our technological replica can serve as privileged standpoints to try to understand the meaning of the shift from using distinguishable words to define humans and technologies (for instance, when we talk about care in the case of the former and maintenance in the case of the latter) to using indistinguishable words to define humans and technologies (for instance, when we talk about patients as follows: “This attracts healthcare providers and stakeholders to maximise their business by making personalised decisions and recommendations for their clients. Beyond this, PDT [personal digital twins] can help people improve their personal productivity development and increase their health longevity by following efficient self-care routines in their daily life”, Sahal, Alsamhi, Brown 2022: 11).

In what follows, I shall try to understand the meaning of the shift described above, first, by introducing the notions of digital twins and human digital twins (section 2), second, by reflecting upon the articulations of human digital twins and their meaning (sections 3 and 4) and, third, by reading them from a philosophical perspective (sections 5 and 6).

2. Digital twins and human digital twins

Even though the notion of digital twins has been introduced in the last years¹, we can find a variety of definitions of digital twins, starting with NASA's in 2012, according to which "[a] digital twin is an integrated multiphysics, multiscale, probabilistic simulation of an as-built vehicle or system that uses the best available physical models, sensor updates, fleet history, etc., to mirror the life of its corresponding flying twin" (Glaessgen, Stargel 2012: 7). In the following years, the variety of definitions of digital twins seems to share the following key point: speaking of digital twins means speaking of three essentials, i.e. a physical object (from the inorganic to the organic), a technological, specifically digital, object and a special relationship between the former and the latter, i.e. a constantly mutual relationship (which means that, if the physical object changes, then the digital object also changes and, if the digital object changes, then the physical object also changes).

As far as the applications of digital twins are concerned, their areas are especially the following three (in descending order in terms of the amount of available literature). First, manufacturing, where digital twins can offer advantages when it comes to monitoring and predicting physical objects' performances in faster and cheaper ways (references on digital twins in manufacturing are several: see at least Holler, Uebernickel, Brenner 2016; Kritzinger *et al.* 2018; Qi, Tao 2018; Lu *et al.* 2020). Second, smart cities, where digital twins can offer advantages when it comes to planning and predicting more efficient urban scenarios, starting with energy saving (see at least Mohammadi, Taylor 2017; Allam, Jones 2021; Deng, Zhang, Shen 2021; Shahat, Hyun, Yeom 2021). As far as the focus on disaster management is concerned, see at least Ford, Wolf 2020; Fana *et al.* 2021; Allam *et al.* 2022). Third, healthcare, where digital twins can offer advantages when it comes to predicting and making decisions from healthcare, starting with drugs and surgery focusing on personalised healthcare, to life expectancy (see at least Bruynseels, Santoni de Sio, van den Hoven 2018; Gahlot, Reddy, Kumar 2019; Kamel

¹ See at least, as far as seminal literature is concerned, Glaessgen, Stargel 2012; Grieves 2014 and, as far as literature reviews are concerned, Negri, Fumagalli, Macchi 2017; Jones *et al.* 2020; Van der Valk *et al.* 2020; Liu *et al.* 2021; Mylonas *et al.* 2021; Botín-Sanabria *et al.* 2022; Fuller *et al.* 2022.

Boulos, Zhang 2021; Popa *et al.* 2021; Okegbile *et al.* 2022; Sahal, Al-samhi, Brown 2022).

The third case, i.e. digital twins applied to healthcare, is most meaningful from a philosophical perspective, in that it introduces a special kind of digital twins: human digital twins, which means, first, that the physical object is not only organic but also human, specifically constitutive of human identity, and, second, that the constantly mutual relationship between the physical object and the digital object, i.e. its digital twin, means not only that the latter changes if the former changes but also, and especially, that the former changes if the latter changes – which gives human digital twins a kind of power over humans that requires a philosophical reflection.

As the history of philosophy shows, a promising way to start a philosophical reflection upon a phenomenon, especially when it is novel, is analysing the way in which our language addresses it. More precisely, in the case of human digital twins, what is promising is analysing the way in which our language increasingly changes when we move from defining ourselves as humans (for instance, when we happen to talk about our health in terms of self-perception) to defining ourselves as counterparts of human digital twins (for instance, when we happen to talk about our health in terms of human digital twins' diagnoses and prognoses).

In what follows, I shall especially analyse two areas in which human digital twins emerge together with the shift described above: the area of healthcare and the area of smart cities. In the former case, the amount of available literature is smaller than in the latter case, but human digital twins are key. Conversely, in the latter case, other kinds of digital twins are key, from structures' to infrastructures', but decision-making emerges as a human capability over which digital twins have power. As far as the methodology is concerned, I shall necessarily select the most meaningful publications (about two dozen) as the best representatives of several publications I reviewed (about two hundred), especially by relying on Web of Science's and Scopus' databases.

3. Human digital twins and humans

As far as the first area is concerned, i.e. healthcare, most of the literature, especially authored by engineers, is enthusiastic about applying human digital twins to healthcare. The key reasons are the following:

1. the relationship between human digital twins and personalised healthcare. More precisely, the latter is thought to be better than traditional healthcare and the former is thought to be the best accelerator of the shift from traditional healthcare to personalised healthcare. For instance, if it is true that human digital twins can “optimise the performance of patient-specific treatment plans” (Okegbile *et al.* 2022: 1), it is also true that they can “recommend lifestyle advice, improve disease prevention and surgical procedures” (Okegbile *et al.* 2022: 1) and “facilitate new drugs and vaccine development without subjecting humans to any form of risk” (Okegbile *et al.* 2022: 1). And the ultimate result of the shift from traditional healthcare to personalised healthcare through human digital twins is a kind of customisation of healthcare that, by explicitly emerging, equally explicitly underpins the shift from what we may define as a humanistic language to what we may define as an engineering language: “Recently, medical technologies have moved from a traditional ‘one-size-fits-most’ model towards the customisation of mass medicine. Therefore, PDT [personal digital twins] could be used for customised short-term and long-term treatment by customising medications for individuals based on their current vital organs status, anatomy, unique genetic makeup, behaviour, daily routines, etc.” (Sahal, Alsamhi, Brown 2022: 23).

2. The relationship between personalised healthcare as accelerated by human digital twins and a language that gets closer and closer to the area of manufacturing. For instance, on the one hand, the area of healthcare gets closer and closer to the area of entrepreneurship, i.e. profit: speaking of “add[ing] value to the healthcare industry through personalised diagnosis and therapy selections” (Okegbile *et al.* 2022: 1) by using human digital twins means speaking of “reducing overall medical costs and time to market of new innovative medications” (Okegbile *et al.* 2022: 1). On the other hand, humans as patients get closer and closer to humans as clients: the authors of one of the publications analysed not only write “clients (i.e. patients)” (Sahal, Alsamhi, Brown 2022: 9), which means that “clients” is primary and “patients” is secondary when it comes to define humans in the area of healthcare as entrepreneurship, i.e. profit, but also repeat it nine times. And the closer patients get to clients, the closer the doctor-patient relationship gets to the relationship between entrepreneurs (who can even more easily sell remotely) and clients (who can even more easily buy remotely): “the [human] digital twin will act as an accelerator for the contemporary switch of focus from treatment to prevention, meaning that the main function of

the data will be to avoid contact with the physician rather than improve this contact” (Popa *et al.* 2021: 10).

3. The relationship between a language that gets closer and closer to the area of manufacturing and humans defined as obtaining more and more non-human prerogatives. For instance, on the one hand, humans obtain the prerogative of being predicted, which is something that usually characterises machines: human digital twins can predict not only “responses to surgical interventions” (Sahal, Alsamhi, Brown 2022: 12) but also, and especially, “the future state of an individual’s health to allow the activation of efficient preventive measures” (Okegbile *et al.* 2022: 1). On the other hand, humans obtain the prerogative of being as immortal as data: human digital twins end up “empowering the world of AI-enhanced humanity, [...] and human immortality through data” (Sahal, Alsamhi, Brown 2022: 12). It is worth noting that the use of human digital twins in the area of healthcare is analogous to their use in the area of sport, where the issue of prediction is identical and, even though the issue of immortality is not explicit, the shift from human prerogatives to non-human prerogatives emerges as the issue of optimisation, specifically a kind of optimisation that is taken to the extreme: for instance, the use of human digital twins “computes trustable predictions of the physical twins’ conditions and produces understandable suggestions which can be used by trainers to trigger optimisation actions in the athletes’ behaviour” (Barricelli *et al.* 2020: 26637).

The trajectory of the three points described above is quite precise. First, what we may define as an engineering language is applied in a direct way to areas focusing on humans, from healthcare to sport, and in an indirect way to humans themselves. Second, the indirect application of an engineering language to humans themselves leads to both the shift from patients to clients and the shift from the doctor-patient relationship (which occurs in presence, i.e. in a mostly analog way) to the relationship between entrepreneurs and clients (which occurs remotely, i.e. in a mostly digital way). Third, the shift from the analog to the digital, specifically from mostly analog human identities and relationships to mostly digital human identities and relationships, leads to what we may define as engineered humans, who, on the one hand, get closer and closer to machines by increasingly obtaining the non-human prerogative (at least up to a point) of being predicted and, on the other hand, get closer and closer to data by increasingly obtaining the non-human prerogative (at least up to a point) of being immortal. In both cases, a kind of optimisation is taken to the extreme. In the case of being predicted,

the purpose is to optimise human bodies' performances, from human bodies as patients, i.e. clients, to human bodies as athletes. In the case of being immortal, the purpose is to optimise life expectancy: if it is true that humans are mortal as analog beings, it is also true that they are immortal as digital beings (it is worth noting that emerging technologies also work on optimising life expectancy in ambitious ways when it comes to humans as analog beings: see at least Aithal, Aithal 2018).

If we move from the literature especially authored by engineers to the literature especially authored by philosophers (which is still minor), then scientists and engineers themselves attribute to philosophers' works critical remarks on the shift described above. For instance, Kamel Boulos and Zhang (2021) attribute to Bruynseels, Santoni de Sio and van den Hoven (2018) the "observ[ation of] close similarities between healthcare practices driven by data and modern engineering approaches driven by digital twins. They noted that the latter applies digital twins for predictive management and maintenance of complex systems, such as identifying faulty parts and simulating intervention outcomes" (Kamel Boulos, Zhang 2021: 6). If we move from Kamel Boulos and Zhang's attribution (2021) to Bruynseels, Santoni de Sio and van den Hoven's work (2018), then the following points emerge. In particular, the issue of humans' optimisation, from healthcare to sport, as correlated to engineering:

[W]hereas the means used to achieve life extension – food, physical activity – clearly fall into the field of natural remedies, the broader process of scientific acquisition of data and of (social) design of which they are part may turn the process into a form of engineering, and therefore, arguably, of human enhancement. [...] The reason to categorize this as enhancement has to be, first of all, with the explicitly engineering nature of this intervention. The [human] digital twin type of data-driven enhancement is to a certain extent an extrapolation of the intensive follow up of professionals in sports. In the case of these athletes, measuring and tracking of all types of parameters, and the resulting continuous optimisations of life style, diet and supplements, can provide a vast competitive advantage over other athletes. (Bruynseels, Santoni de Sio, van den Hoven 2018: 7)

In general, the issue of what we may define as engineered humans is correlated to the increasing transfer of words from a humanistic language to an engineering language: human "[d]igital twins therefore provide a conceptual instrument to analyse the impact of these novel engineering practices on core concepts in current debates on healthcare, like health, disease, preventative care, and enhancement. One can ana-

lyse these healthcare concepts in analogy with engineering concepts of ‘normal functioning’, ‘malfunctioning’, ‘predictive maintenance’, ‘performance optimisation’, and the ‘implementation of new functionality’” (Bruynseels, Santoni de Sio, van den Hoven 2018: 2). Thus, we may say that, the more humans understand themselves through human digital twins, the more their bodies, specifically their perceptions and definitions of their bodies, move from words such as “I feel good” and “I do not feel good” to the words quoted above (“normal functioning” and “malfunctioning”), from words such as “care” to the words quoted above (“predictive maintenance”), from words such as “patient recovery” to the words quoted above (“performance optimisation”) and from words such as “personal development” to the words quoted above (“implementation of new functionality”).

As far as the second area is concerned, i.e. smart cities (on which my focus shall be circumscribed, in that other kinds of digital twins are key, from structures’ to infrastructures’), at least the following three points should be addressed:

1. even though cities are characterised by the kind of irreducible complexity that characterises millions of humans living together, the engineering of cities, especially through digital twins, also emerges: for instance, “an increased reliance upon digitalization [will open] [...] up avenues for the automation of cities” (Allam, Jones 2021: 3).

2. Again, despite the irreducible complexity characterising cities overcrowded by humans, the words we have already seen in the case of human digital twins applied to healthcare, i.e. optimisation, performance and prediction, also emerge: for instance, “future forecasting and optimisation of the physical entity’s performance are realizable, and thus the optimisation of the physical counterpart’s performance can be achieved” (Shahat, Hyun and Yeom 2021: 3).

3. Again, despite the irreducible complexity characterising cities overcrowded by humans, structures’ and infrastructures’ digital twins also have power over decision-making as a human capability: for instance, “[t]he digital twin, as an inevitable trend of digital transformation, helps cities realize real-time remote monitoring, and allows more effective decision-making” (Deng, Zhang, Shen 2021: 125).

It is worth noting that the issue of digital twins’ power over decision-making as a human capability also emerges in several other articulations of the three areas listed above, from manufacturing to smart cities to healthcare. For instance, in one of the most powerful economic sectors, i.e. finance, digital twins start to be considered as the best advisors to

make decisions: “Making better and faster decisions that can be executed flawlessly is critical for delivering superior and long-term business value to organisations. DT [Digital twins] could perhaps be the key to making intelligent decisions in this new reality” (Anshari, Almunawar, Masri 2022: 4).

Thus, the engineering of what is most complex, from humans as single individuals to cities as millions of humans living together, seems to address the issue of a kind of reducibility of what is hardly reducible – as I shall argue in the following sections, the engineering of what is most complex, especially through human digital twins, seems to address the issue of complexity through something quite precise from a philosophical perspective: not only the attempt to reduce what is hardly reducible by moving from the analog to the digital, which is more controllable, but also the attempt to reduce the kind of epistemology that has been characterising Western culture for millennia (see at least Nowak 1980; Brzeziński *et al.* 1990a, 1990b; Brzeziński, Nowak 1992; Coniglione, Poli, Rollinger 2004; Cartwright, Jones 2005) by moving from the explainability of the particular through the universal to the explainability of the particular through the particular.

But, before reading the issues described above from a philosophical perspective, more attention to what seems to emerge as the key issue should be paid: the key issue of the variety of ways in which we increasingly engineer our language when we talk about ourselves in our technological era.

4. *Engineered humans*

We may start with the following remark: the amount of times we find the words we have reflected upon, especially “optimisation”, is impressive. For instance, in Barricelli *et al.* (2020), we find fourteen occurrences of the noun “optimisation” and seven occurrences of the (variously conjugated) verb “optimise” and, in Shahat, Hyun and Yeom (2021), we find three occurrences of the noun “optimisation” and six occurrences of the (variously conjugated) verb “optimise”. The stress on the notion of optimisation leads to the stress on something more general: the notion of efficiency (for instance, in Shahat, Hyun and Yeom 2021, we find nine occurrences of the noun “efficiency” and three occurrences of the adjective “efficient”). The introduction of the notion of efficiency is meaningful, in that it leads to reflect upon a phenomenon on which

human and social scientists extensively work: the rise of the idea according to which efficiency is primary not only when it comes to things that should perform in a perfect way but also when it comes to humans who, starting with their bodies, should equally perform in a perfect way – more precisely, we may say that humans should perform in an efficient way, i.e. make “a good use of time and energy, without wasting any”² (which is an idea that continuously emerges, as I shall show in what follows. On the relationship between efficiency and human bodies, see at least Littlefield 2018; Reagle 2019).

Actually, efficiency as making “a good use of time and energy, without wasting any”, characterises innumerable publications on human digital twins. As far as the general idea of efficiency is concerned, we find it, for instance, in the following cases. When it comes to smart cities, where digital twins “are used to improve not only data collection efficiency but also decision-making”, in that they are the answer to the following question: “How can managers acquire all the data needed to choose effective and efficient strategies during a disaster?” (Ford, Wolf 2020: 4). And where a technologically “optimis[ed] efficiency [...] increase[s] the prospect of efficiency [itself] in many frontiers such as decision making, improving performance” (Allam *et al.* 2022: 10, 13). When it comes to finance, where “using DG [digital twins] [...] has the potential to increase the efficiency of the personal financial management process as users could manage and enhance their knowledge” (Anshari, Almunawar, Masri 2022: 7). And when it comes to organisational control, where “[m]any potential and perceived benefits already can be attributed to the digital twin, such as [...] efficiency [...], since digital replication of organizational processes can determine the most efficient way to conduct business”, which “allows for performance improvement” (Ukko *et al.* 2022: 257, 254).

As far as the particular idea of efficiency as “a good use of time and energy, without wasting any”, is concerned, we find it, for instance, in the following cases. On the one hand, when we literally talk about “time and energy”, the issue of speed as a crucial value shows up: time is not only something to accelerate, “allowing for real-time predictions, among others” (Allam *et al.* 2022: 13), but also something to “cut” (Anshari, Almunawar, Masri 2022: 7). More precisely, time is something to accel-

² See <https://dictionary.cambridge.org/dictionary/english-italian/efficiency> (accessed in September 2022).

erate, and even to “cut”, when humans have to make decisions: “it is possible to use digital replication to see how quickly an organization could respond to a decision. Thus, there is huge potential to develop organizational agility through fast and intelligent decisions based on real-time data” (Ukko *et al.* 2022: 254), in that “real-time data available from [...] technologies can reduce the time to obtain data and improve decisions by providing additional information as [...] management leaders respond to conditions that often change quickly, requiring quick responses” (Ford, Wolf 2020: 1-2). Interestingly enough, decision-making as a human capability moves from being the core of the greatest masterpieces of Western literature, from Sophocles’ heroes to Shakespeare’s to Pirandello’s, who measure themselves against their capability to bear the burden of their autonomous decisions (see especially Soph. *OT*, Shakespeare 1998 and Pirandello 1925), to being the core business of technological automation³. On the other hand, when we metaphorically talk about “time and energy”, the issue of money-making as a crucial value shows up: “cutting costs” (in both Anshari, Almunawar, Masri 2022: 7 and Ukko *et al.* 2022: 257, but anywhere through other words) is the mantra, from money-saving (in that, “through fast and inexpensive experimentation”, Ford, Wolf 2020: 2, “[d]igitally replicating [...] processes allows people to save costs by determining the most efficient ways to conduct business”, Ukko *et al.* 2022: 254) to money-making (in that, even in the area of healthcare, if it is true that analog patients become digital clients, as we have seen, it is also true that “[t]he healthcare industry is adopting emerging technologies such as IoT [internet of things], AI [artificial intelligence], and DTs [digital twins] to improve business”, Sahal, Alsamhi, Brown 2022: 15).

Thus, the following key issues emerge: the stress on optimisation, which leads to the stress on efficiency, which means engineering human “time and energy” as speed in general, on the one hand, and as money-making in particular, on the other hand, but, in both cases, with a special focus on decision-making. More precisely, the following idea of humans emerges: the more optimised and efficient they are, especially in accelerating decision-making and, consequently, money-making, the better they are – we may say that, the more engineered humans are (in that they identify their purpose not with feeling good, for instance, but

³ I extensively worked on the issue of trading human autonomy for technological automation in Chiodo 2022 and 2023.

with preforming in faster and more profitable ways), the better they are (in that they measure themselves not against typically human values, such as feeling good, for instance, but against typically engineering values, such as efficiency).

It is no coincidence that human and social scientists who start critically focusing on digital twins, especially human digital twins, remark the key issue of optimisation in particular and other resulting issues in general. As far as the key issue of optimisation is concerned, scholars of the humanities and the social sciences point to digital twins, especially human digital twins, considered as “the most optimal solution” (Bruynseels, Santoni de Sio, van den Hoven 2018: 9), which “is expected to signal deficiencies in the physical entity and/or to offer directions for optimisation. A digital twin thus not merely describes the physical entity it represents, but also prescribes how the physical entity ideally should function” (Korenhof, Blok, Kloppenburg 2021: 1756). As far as other resulting issues are concerned, scholars of the humanities and the social sciences point to the “reductionist approach focused on efficiency and optimisation” (Korenhof, Blok, Kloppenburg 2021: 1753) that characterises the “current understandings of digital twins in the technical academic discourse” (Korenhof, Blok, Kloppenburg 2021: 1753) to argue that, if the issue of optimisation is key in both “the technical academic discourse” in particular and “the technical discourse in general” (Korenhof, Blok, Kloppenburg 2021: 1765), then the use of the word “optimisation” is followed “by the use of words like [...] ‘increase efficiency’, ‘anomaly’, ‘deviation’, ‘undesired’, and ‘correct’” (Korenhof, Blok, Kloppenburg 2021: 1756), and, again, “‘better management and control’, ‘diagnostics’, ‘health management’, to ‘increase lifespan and success’, etcetera” (Korenhof, Blok, Kloppenburg 2021: 1765).

But what may be the philosophical meaning of both the key issue of optimisation and other resulting issues? After a first step, which is a matter of analysing our language to understand that there is an impressive shift from words defining humans as analog beings and patients, for instance, to words defining humans as digital beings and clients, for instance, who should “increase efficiency”, “lifespan and success” and “correct” through “better management and control”, “diagnostics” and “health management” to prevent “anomaly”, “deviation” and the “undesired”, there may be a second step, which is a matter of reflecting upon the philosophical meaning of the words quoted above by trying to understand them against the background of the relationship between our identity as humans and our technological era – which means trying

to answer the following question: if we increasingly engineer our identity as humans, then why do we do it? More precisely, if technology is (purposely) created by us, then why do we (purposely) create something whose ontological prerogatives we increasingly trade for our ontological prerogatives?

5. *Philosophical remarks*

Interestingly enough, human sleep has recently moved from being a kind of empty time (before Freud's revolution) to being something crucial to analyse (after Freud's revolution) to being something crucial to optimise (in our technological era). For instance,

A novel and more radical feature emerged [...] within the category of sleep management functions. The Sleep Cycle monitoring apps incorporated a range of management functions, often set manually to enable personalised and customised reminders or sounds relating to going to sleep or waking up (e.g., customisable alarm sounds, manually set sleep/wake time, sleep aid sounds, bedtime reminder). A significant extension of sleep management functions, however, is the algorithmically determined "smart wake up" feature [...] [that] extends from assisting with sleep management to automating sleep-wake rhythms. Going beyond measurement, these apps offer a more direct "intervention" into the timing of the user's wake up at the most optimal point within the phases of the sleep cycle. [...] [T]he "smartness" of the app indicates a shift from disciplinary self-mastery to a more distributed and adaptive form of delegated monitoring and optimised intervention. [...] If the sleep trackers are concerned with tracking the cyclical times of the day, our circadian biorhythms, the "smart wake up" feature attempts to divine and/or produce a precise moment in optimising sleeping and waking rhythms. (O'Neill, Nansen 2019: no page number. See also Williams, Coveney, Gabe 2013; Baron *et al.* 2017; Lyall 2021)

What is most interesting from a philosophical perspective is the paradox we may describe as follows. On the one hand, again, the purpose is optimisation, specifically "optimising sleeping and waking rhythms" to be better, specifically to perform better, from human bodies' performances to human minds' performances. On the other hand, optimisation is externalised from humans to technologies: even though humans are asked to be and perform better, "self-mastery", which is even constitutive of being and performing better, is replaced by "automating sleep-wake rhythms". Metaphorically speaking, it is as if we wanted to improve our running speed by taking the bus. On the one hand, we want to optimise

ourselves and, on the other hand, we trade our capabilities underpinning any kind of optimisation for technological automation – paradoxically enough, human capabilities underpinning any kind of optimisation, starting with the human capability of “self-mastering”, are traded for technological automation as what increasingly atrophies human capabilities themselves and, consequently, actual optimisation itself.

The case of human sleep exemplifies a phenomenon that becomes more and more frequent in our technological era. For instance, in the case of the great variety of technologies addressing health, we may say that we frequently do what follows. On the one hand, our purpose is to optimise our bodies’ performances and, on the other hand, optimisation is externalised from ourselves to technologies for which we trade our capability to self-perceive ourselves by recognising the slightest symptoms, as it is the case of the following testimonies of experienced self-trackers. In the first case, “[w]e (the apps and I) had co-constructed a digital model of my self, and here I was, managing myself, it seems, by proxy. The feedback from that digital model often took precedence over how I physically felt. When I didn’t eat ‘enough’ protein I felt weaker, and when I had too much sugar I felt fatter. These were delayed reactions; a re-reading of my body from the model. I’ve yet to decide: is this model pushing me closer in contact or further away from my self and my world?” (Williams 2013: 3). In the second case, the answer to the question quoted above is crystal clear: the author of the testimony decides to stop self-tracking, in that “I had stopped trusting myself / letting the numbers drown out / my intuition / my instincts[.] / Each day / my self-worth was tied to the data[.] / One pound heavier this morning? / You’re fat. / 2 g too much fat ingested? / You’re out of control. / Skipped a day of running? / You’re lazy” (Carmichael 2010: no page number). And, as far as the case of human sleep in particular is concerned, the following testimony is remarkable: “when I see the numbers from Basis contradict my positive assessment of my rest, my sense of having rested well is suddenly undermined as if those Basis numbers somehow have the power to make me doubt my own experience”⁴. Again, the paradox is that, the more we work on optimising ourselves, the more we work on moving optimisation from ourselves, i.e. our capabilities as autonomous humans, to technologies, i.e. ways of engineering, specifically automat-

⁴ See <https://quantifiedself.com/show-and-tell/?project=756> (accessed in September 2022).

ing, ourselves – and even “self-mastery” increasingly dissolves in something engineered, specifically automated.

What may be the philosophical meaning of the paradox described above? In what follows, I shall necessarily focus on one possible articulation of its philosophical meaning, in that I believe that it is key. Several scholars of the humanities and the social sciences agree that the stress on optimisation and efficiency results from capitalism⁵. Actually, as we have seen, speaking of optimisation and efficiency frequently means speaking of money-making. Yet, there seems to be something more than capitalism underpinning the complex phenomenon described above. More precisely, there seems to be a kind of paradoxical counterforce: if it is true that, on the one hand, we desperately try to optimise ourselves by engineering ourselves (which frequently means trying to make more money), it is also true that, on the other hand, we also seem to do something quite opposite: we also seem to desperately try to self-sabotage our optimisation – and, again, engineering ourselves seems to be our best ally: whenever we engineer ourselves in the ways described above, we also trade our autonomy for technological automation, which means that we also move the burden of optimisation from ourselves, i.e. our capabilities (for which we are and feel totally responsible), to technology, i.e. our decisions and actions as nothing but technology’s outputs (for which we are not and do not feel totally responsible).

Let us go back to the case of human digital twins, and let us imagine the following scenario. As we have seen, one of human digital twins’ primary purposes is prediction: their use “computes trustable predictions of the physical twins’ conditions” and “the future state of an individual’s health to allow the activation of efficient preventive measures”. Which is something quite different not only from what we are likely to expect from our doctors (their predictions, i.e. prognoses, are not likely to be described as “compute[d] trustable predictions”, i.e. exceedingly “trustable”) but also, and especially, from what we are likely to expect from ourselves (our predictions, i.e. self-perceptions, are not likely to be described as “compute[d] trustable predictions”, i.e. exceedingly “trustable”, at all). Thus, we have the following kind of hierarchy: we are likely to think of our digital twins as the most reliable, our doctors as less reli-

⁵ Publications are innumerable, but, especially as far as the cases we have seen are concerned, see at least Crary 2013; Sadowski 2020.

able and ourselves as the less reliable. What may be the consequences of what we are likely to think? At least the following two:

1. We may start increasingly atrophying our capability to self-perceive ourselves: paradoxically enough, we optimise ourselves, specifically our health, by increasingly becoming nothing but our digital twins' outputs – we optimise ourselves by increasingly worsening ourselves, i.e. self-perception as one of our best capabilities. Other cases we have analysed show something identical, when “[t]he feedback from that digital model often took precedence over how I physically felt”, when “I had stopped trusting myself / letting the numbers drown out / my intuition / my instincts” and when “those Basis numbers somehow have the power to make me doubt my own experience”. Thus, the less we rely on self-perception, the less we exercise it and, consequently, the more we risk atrophying it.

2. Our doctors may start increasingly atrophying their capability to make prognoses as something resulting not only from technology but also from their complex expertise, from their knowledge to their experience to their “intuition” and “instincts”, especially when “the main function of the [human digital twins'] data will be to avoid contact with the physician rather than improve this contact”. If our future doctors are likely to make prognoses by reading technology's outputs, then what is it likely to happen to us if what can be perceived by examining our bodies can still exceed what can be computed? Paradoxically enough, our doctors optimise themselves, specifically their capability to make prognoses, by increasingly making them become nothing but our digital twins' outputs – our doctors optimise themselves by increasingly worsening themselves, i.e. their capability to make prognoses as something also resulting from their complex expertise, from their knowledge to their experience to their “intuition” and “instincts”. Any patient may have happened to hear, especially years ago, the following words spoken by their doctors: “There is something wrong with you, I can see it in your eyes”. What may happen to us if our doctors stop exercising their capability, which is sometimes lifesaving, to make prognoses as something also resulting from their “intuition” and “instincts”, if the less they rely on them, the less they exercise them and, consequently, the more they risk atrophying them? And what may happen to us if what we need most is empathy, but “the main function of the [human digital twins'] data will be to avoid contact with the physician rather than improve this contact”?

Yet, the paradoxical counterforce described above is not likely to be nothing but the failure of the attempt to optimise ourselves. If it is true that failures are several, from worsening self-perception to worsening the capability to make prognoses as something also resulting from “intuition” and “instincts” (in medicine in particular and in decision-making in general), it is also true that failures are likely to be somehow further kinds of attempts – thus, the philosophical issue to address may be the following: are failures likely to be somehow attempted, and why?

Sometimes unconsciously and sometimes consciously, the failures we have described above seem to be nothing but self-sabotages. Whenever we replace self-perception with data, we not only fail in the sense that we worsen self-perception. We also succeed in something that may be even more important than not atrophying self-perception – we succeed in unburdening ourselves from the great burden of our autonomy as what has defined human identity in Western culture from Sophocles’ heroes to Shakespeare’s to Pirandello’s, as we have seen, especially in the last three centuries, starting with Kant’s notion of autonomy (see Kant 1785 and 1788⁶). More precisely, from an epistemological perspective, we unburden ourselves from the great burden of (individual) epistemological responsibility when it comes to make decisions that exclusively result from our capabilities, from rationality to “intuition” and “instincts”, and finally turn out to be wrong. For instance, we may imagine that, if Shakespeare’s Hamlet would have used digital technologies to decide whether or not to avenge his father’s death, then the burden of his own epistemological responsibility would have been greatly relieved. Do we want our own epistemological responsibility to be equally relieved when we have to make decisions on ourselves and the others, including when we are doctors and the others are our patients? From an ethical perspective, we unburden ourselves from the great burden of (individual) ethical responsibility when it comes to do actions that exclusively result from our decisions and finally turn out to be wrong. For instance, we may imagine that, if Shakespeare’s Hamlet would have acted according to digital technologies’ outputs, then the burden of his own ethical responsibility would have been greatly relieved. Do we want our own ethical responsibility to be equally relieved when we have to do ac-

⁶ As far as the perspective I consider is concerned, see at least Hill 1989; Korsgaard 1996a and 1996b; Guyer 2003; Reath 2006; Deligiorgi 2012; Sensen 2013.

tions on ourselves and the others, including when we are doctors and the others are our patients?

Whatever the answer, the great variety of analogous cases seems to show that humans increasingly self-sabotage. First, they strive to optimise themselves by engineering themselves through technologies. Second, the paradoxical counterforce described above emerges: they strive to worsen themselves, again, by engineering themselves through technologies, in that they, as engineered humans, give away autonomy and take on automation – they, as engineered humans, give away the burden of (individual) epistemological and ethical responsibilities, together with (individual) epistemological and ethical capabilities, and take on the relief of more and more automated decisions and actions.

For instance, optimisation also seems to move from being a human burden (arising from autonomy, i.e. autonomous capabilities) to being a technological relief (arising from automation, i.e. automated outputs moving from technologies to humans) in the following cases. Whenever architects, i.e. creatives, pursue optimisation by using softwares that can allow them to input a series of data and obtain an architectural design almost ready to use⁷ (but what if they stop exercising, i.e. optimising, their own autonomous creativity, in that they think of it as something more and more useless?). Whenever writers, i.e. creatives, pursue optimisation by using softwares than can allow them to input a series of data and obtain an article almost ready to use⁸ (but what if they stop

⁷ See, for instance, <https://academy.archistar.ai/top-ten-design-software-for-architects> (accessed in September 2022), which reports the list of “the top ten design software for architects”: “design software automates common processes. This allows you to save time. You can get designs to clients quicker and enjoy a more efficient workflow. [...] Its key feature is automation. [...] the software offers several tools for automating complicated processes. For example, it has an inbuilt library of stair and rail designs. [...] You only need to enter a number into your variable to create the desired number of elements”.

⁸ See, for instance, <https://hostingtribunal.com/best/article-generator-software/#gref> (accessed in September 2022), which reports the list of “the best article generator software”: “WordAi understands your source material – whether it’s in English, Spanish, French, or Italian – and rephrases it as a human would. It’s a smart, accurate, and easy-to-use content generator, great for spinning scrapped articles or generating fresh articles for SEO. [...] SEO Content Machine is a full-featured app that helps you generate, illustrate, and publish high-ranking content. Built with SEO in mind, this AI also provides link building tools and impressive integrations with popular software. [...] Just give Articoolo a topic, and it will generate a unique article for you. The AI gathers sources online and structures a piece for any niche – all at the

exercising, i.e. optimising, their own autonomous creativity, in that they think of it as something more and more useless?). Whenever we use self-tracking technologies designed to explicitly show that we can somehow optimise our health even though we are not doctors, i.e. even without bearing the burden of epistemological and ethical expertise, because we can rely on technology, which promises to be far more relieving (but what if we and our doctors stop exercising, i.e. optimising, our own autonomous doctor-patient relationship, in that we and our doctors think of it as something more and more useless?). Whenever we use digital platforms designed to explicitly show that we can somehow optimise the drafting of our laws even though we are not jurists, i.e. even without bearing the burden of epistemological and ethical expertise, because we can rely on technology, which promises to be far more relieving⁹ (but what if jurists stop exercising, i.e. optimising, their own autonomous expertise as jurists, in that they think of it as something more and more useless?). Whenever we use social media platforms designed to explicitly show that we can somehow optimise almost whatever profession, from cooking to coaching, even though we are not professionals, from cooks to coaches, i.e. even without bearing the burden of epistemological and ethical expertise, because we can rely on technology, which promises to be far more relieving (but what if cooks and coaches stop exercising, i.e. optimising, their own autonomous expertise as cooks and coaches, in that they think of it as something more and more useless?). Whenever we use search engines designed to explicitly show that we can somehow optimise our information retrieval even though we are not journalists, i.e. even without bearing the burden of epistemological and ethical expertise, because we can rely on technology, which promises to be far more relieving (but what if journalists stop exercising, i.e. optimising, their own autonomous expertise as journalists, in that they think of it as something more and more useless?). And so forth¹⁰.

In the cases listed above, self-sabotage emerges as something that, from a philosophical perspective, may be thought of as the crisis of au-

click of a button. Plus, Articoolo can also help you spin old content for an SEO boost or summarise articles to pack value for readers”.

⁹ For instance, in the case of the Italian Five Star Movement.

¹⁰ As far as the more general issue of the crisis of expertise is concerned, see at least, for an instructive sociological perspective, Eyal 2019.

tonomy, which is not only the measure of humans' success, from Sophocles' heroes to Shakespeare's to Pirandello's, in that they measure themselves against their capability to bear the burden of their autonomous decisions and actions, but also, and especially, what Kant defines as "the ground of the dignity of human nature and of every rational nature" (Kant 1785: 4, 436) that, consequently, makes humans "culpable and deserving of punishment" (Kant 1788: 5, 100) if their autonomous decisions and actions turn out to be wrong – thus, is it our autonomy as what makes us "culpable and deserving of punishment" what we sabotage through technology by engineering ourselves? Actually, as Kant teaches us, if we are not autonomous, but automated¹¹, then we are not epistemologically and ethically responsible at all: "no moral law is possible and no imputation in accordance with it" (Kant 1788: 5, 97) – thus, is it our automation as what relieves us from both failures and "punishment" and "imputation" what we take from technology by engineering ourselves?

The last two questions are rhetorical, in that their possible affirmative answers are precisely what I have tried to argue through the analysis of the cases we have seen. If we add that, after Kant, autonomy even increases as the key measure of humans' success as single individuals, at least in Western culture¹², then its burden emerges as increasingly unbearable. Thus, again, two quite opposite forces equally emerge: on the one hand, the force that desperately drives humans to optimise and, on the other hand, its paradoxical counterforce that desperately drives humans to self-sabotage optimisation. In both cases, technology is humans' best ally: in the first case, as what tries to dissolve humans' decisions and actions in efficient outputs and, in the second case, as what tries to dissolve efficiency in something that is not a matter of human autonomy, but a matter of technological automation – in both cases, humans engineer themselves.

¹¹ See Kant's notion of *automaton spirituale*, which means that, if we are not autonomous (by making our own decisions and doing our own actions), but automated (by following heteronomous outputs), then "the freedom of our will were none other than [...] the freedom of a turnspit, which, when once it is wound up, also accomplishes its movements of itself" (Kant 1788: 5, 97).

¹² From Korsgaard, who follows Kant's lesson and remarks that autonomy even "express[es] your identity, your nature" (Korsgaard 1996b: 84), to philosophers who work on autonomy as a kind of individualism (see at least Dworkin 1988; Frankfurt 1999).

6. Conclusion

As we have seen, several technologies can show the phenomenon described above. Yet, human digital twins can even stress it: on the one hand, there is a question as physical objects, i.e. humans, and, on the other hand, there is an answer as technological, specifically digital, objects. Human digital twins can also show a further phenomenon we have seen: the engineering of what is most complex, specifically humans, may be thought of not only as the attempt to reduce what is hardly reducible by moving from the analog to the digital, which is more controllable, but also as the attempt to reduce the kind of epistemology that has been characterising Western culture for millennia by moving from the explainability of the particular through the universal to the explainability of the particular through the particular. I cannot address it in what follows¹³, but at least one question is worth asking: if the more technology develops, the more personalised it becomes, from personal computers to human digital twins underpinning personalised medicine, then what may be the destiny not only of an epistemology arising from a kind of universality that can make at least intelligible to me what matters to you (for instance, what is true and what is false for you) but also of an ethics arising from a kind of universality that can make at least intelligible to me what matters to you (for instance, what is right and what is wrong for you)?

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¹³ I extensively worked on the issue of the dissolution of the dimension of universality in the dimension of particularity through technology in Chiodo 2020.

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