TECHNO PHILOSOPHY IN PRACTICE

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Fontys

› FOR SOCIETY

Contents

BRIEF INTRODUCTION TO TECHNO PHILOSOPHY INCLUDING PRACTICAL APPLICATIONS FOR HIGHER PROFESSIONAL EDUCATION (HBO) STUDENTS AND OTHER INTERESTED PARTIES

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Introduction

We are technological creatures. To a large extent, our living environment and the life we live is defined by technology. New technologies lead to new realities that become part of the context in which we live: 'technities'. Technities are entities that emerge from the technologies we develop. Examples of technities include the temperature measurement of a thermometer, the daily step count of a pedometer, the screen time on your smartphone, the heart rate measurement of a jogging tracker, the online or 'reading' status on Whatsapp, etc. Another great example of a technity is ultrasound, which we will come back to in Chapter 1. Technologies and technities are all around us, helping us define the quality of life we experience. They require us to constantly redefine our (ethical) standpoints. Making informed decisions in this regard helps us live the lives we want to lead with technology.

Humans and technology are strongly intertwined throughout all levels of society. Technology is also playing an increasingly important role in every Fontys study programme, which is why Fontys has defined 'for Society' as its focal point for the years to come. At Fontys University of Applied Sciences ICT, we teach our students to create ICT products, which includes designing, building and managing. In our opinion, this compels us, along with our students, to consider the impact that technology has on people and society. Due to the high level of pervasiveness of ICT in all areas of society, this applies equally to each and every Fontys study programme.

We can't get away with just making it – Huub Prüst –

Technology is being developed at a rapid pace. This means that we are forced to constantly reconsider our relationship with technology. Creating technology also brings with it the responsibility of examining what that technology will or can do to people. This calls for ethics to be considered early on in the process. The pervasive technology of smartphones and apps raises questions about stakeholder interests and human values. The formation of monopolies with companies such as Google and Facebook raises questions about the role of stakeholders and social relationships.

First we shape our tools and thereafter our tools shape us – Marshall McLuhan –

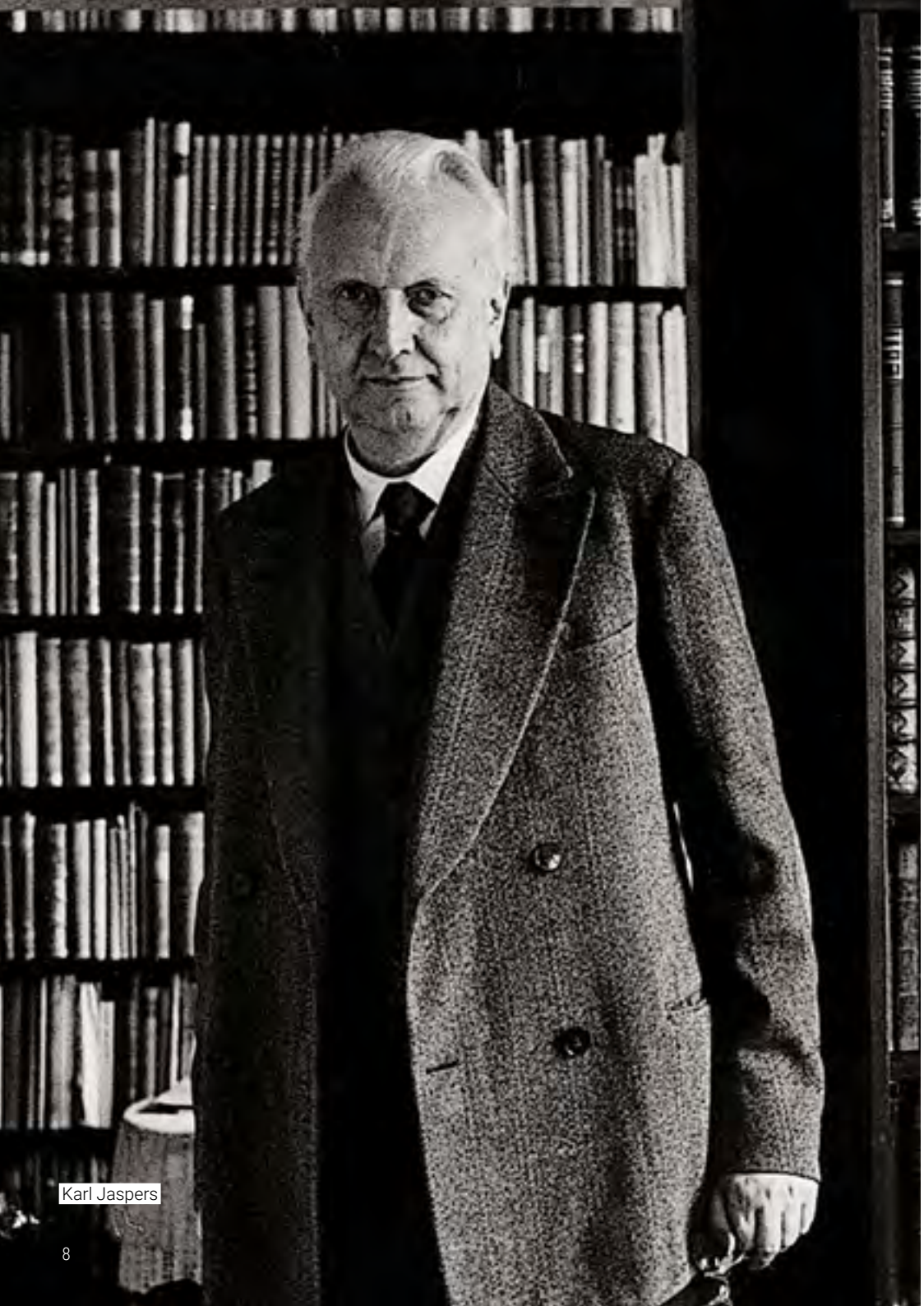
This paper presents an approach as well as a tool that can be used in concrete terms at the level of higher professional education (HBO) for the purpose of exploring the constantly changing relationship between humans and technology. Chapter 1 briefly describes the general basic philosophical background behind the relationship between humans and technology. In Chapters 2 and 3, we move on to the impact and the ethics of humans and technology as driving forces in the design and development of technology. In line with the vision of Peter Paul Verbeek (Verbeek, 2014 and 2015), we argue for a guiding approach to ethics that supports the development of technology, as opposed to one based on more detached ethical judgements. We have developed a tool for this purpose called the Technology Impact Cycle Tool (available at www.tict.io).

SECTION 1

PHILOSOPHY OF TECHNOLOGY

The philosophy of technology is a philosophical discipline that examines the nature and meaning of technology as well as the relationship between technology, humans and society (translation of Dutch Wikipedia content - Techniekfilosofie, 2018).
The expression "philosophy of technology" was first coined in the late 19th century by the German-born philosopher and geographer Ernst Kapp, who published a book entitled "Elements of a Philosophy of Technology". Throughout the history of philosophy, technology has been seen as something separate from humans. Ever since Aristotle, we have been philosophising about the ethical implications of technology (Gómez, R.J. 2010). The ancient Greeks saw technical gadgets as an ethically neutral means of achieving human objectives. Plato criticised technology early on by saying that technology (through ***hypomnese***) leads to the impoverishment of man. In the history of philosophy, technology was seen not only as separate from humans but also from science. Science involved the acquisition of knowledge, while technology was 'merely' an application of it. It is only in modern times that a successful marriage between the (natural) sciences and technology has emerged. In today's world view, we base our knowledge on scientific research. Scientific facts determine what is true and what is not. Many of these scientific results are obtained through analyses conducted with the help of technology. In our society, technology is a means of analysing reality and adapting it to our needs. These means have advanced significantly over the past 100 years, and today's (Western) society is unimaginable without the extensive presence of technological devices.

This dramatic progress has also led to a greater emphasis on philosophical discussions about technology. We will address two important positions here, as they demonstrate two extremes regarding our way of thinking about interactions between humans and technology. Firstly, we will examine the instrumentalist view of Karl Jaspers, who saw technology as a neutral tool. Then we look at the other 'deterministic' extreme of Martin Heidegger. Afterwards, we will consider the intermediate position of Peter Paul Verbeek, who has combined the analyses of Jaspers and Heidegger into a philosophy in which humans and technology both define each other. In our view, the latter position is a pragmatic perspective that is in keeping with the reality of education at universities of applied sciences in the Netherlands, where students are inevitably confronted with new technological developments.



Karl Jaspers

1.1 Karl Jaspers and instrumentalism: technology is neutral

The German-Swiss psychiatrist and philosopher Karl Jaspers (1883 - 1969) was one of the first philosophers to address technology. Jaspers saw that increasing industrialisation was allowing more and more people to provide for their basic needs. In order to support this industrial system, people had to perform certain roles within it. This alienated people from their material environment (Verbeek, 2000, p. 47).

Verbeek criticises Jaspers' analysis of technology as he first brings the conditions of the possibility of technology to light and then uses them to define the entire nature of technology. When examining the relationship between humans and technology, Jaspers primarily looks at mass production. This is understandable, as this was the developing technology in his time. Mass production is only possible if society is organised in a certain way. For example, a large working class is needed that is constantly busy working with machines to keep the process going. Also, the production process is divided into small steps, where a single worker no longer has to go through the entire process, but instead performs a single repetitive action. Jaspers translates this kind of social organisation into the very nature of technology. Jaspers' analysis only looks at technology from the outside. If we look at technology in practice, we see that humans and technology can influence each other in many different ways. We will discuss this in more detail in Section 1.3.

Example: Facebook as a neutral medium

We can see the instrumentalist view reflected in Mark Zuckerberg's statement that people go online mainly because it enables them to do things more efficiently. Facebook makes it possible for people to maintain their social contacts. The success of platforms such as Facebook is due to the function they fulfil in people's lives. Zuckerberg sees Facebook as a neutral means of communication. Neutrality, however, is called into question as the very use of Facebook influences how social relationships between people develop. Inviting people to a birthday party, for example, is easier through the Facebook channel, and also has a greater reach. Facebook contacts are invited, but others are excluded. However, it is no longer very easy for individuals to do something different, to define a different goal. People can decide whether or not they want to use Facebook any more. They will then either be invited to activities by their friends or they will miss out on birthdays if they no longer keep an eye on Facebook.

Martin Heidegger

1.2 Heidegger and determinism: technology as an unstoppable force of nature

The German philosopher Martin Heidegger (1889-1976) argued against the image of technology as a neutral tool. Heidegger called that representation 'instrumental'. Heidegger, while agreeing with the analysis of technology as instrumental, said that we need to look deeper. He explored technology as a social and cultural phenomenon. In doing so, Heidegger posed the question of how technology shapes the way people access reality. According to Heidegger, in modern times we understand reality to be a supply of raw materials and energy at our disposal. This way of looking at the world becomes dominant because technology requires that people see the world in this way. As a result, people tend to forget the original way of being, believing there is a certain way in which things have always manifested themselves. Technology begins to define its goals independently of humans, and humans are only part of the larger technological system (Verbeek, 2000, p. 73-74).
The view that everything is a logical consequence of the preceding circumstances is called determinism. When this is interpreted as meaning that there can be no free will, it is called hard determinism (James, 1912). In Heidegger's perspective, technology determines man's worldview and therefore also the actions of man. For that reason, we refer to this as determinism and even as hard determinism in this case (Wernaart, 2020).

In ethics, we usually assume that people are able to think freely. Some argue that determinism is flawed: moral judgements can only exist if there are several moral alternatives to choose from (Van Inwagen, 1983). Such a view is also called incompatibilism, because free will is not 'compatible' with the deterministic viewpoint. Thus, instead of determinism, there is a kind of Principle of Alternative Possibilities, in which individuals are confronted with different moral actions they could perform at any given time (Wernaart, 2020).

The criticism of Heidegger is that, just as with Jasper, technology is also reduced to its conditions of possibility. He examined what it is like to live in a world permeated by technology. Heidegger looked at technology in general, and not at how a particular technology functions in a particular context. This creates an interesting analysis that is true in certain contexts, but does not hold true for other technologies in other contexts. This makes it difficult to distinguish between the changes that technology brings about and our ability to steer them in a preferred direction. One remains trapped in an extreme utopian or doomsday scenario together with the apathy that ensues.

Example: Uber and the taxi market

Uber can primarily be seen as an instrumental tool for users of a taxi service. People want to travel from A to B. In the past, people would call a taxi company, and a taxi with an anonymous driver would be sent to the customer. Users had no prior insight into the vehicle layout, the cost of the journey or how the process worked. In the 'sharing economy', we often see a platform conquering the conventional market through a combination of market forces and network technology. With Uber, the user's goal has remained the same, but the user experience has been improved. The user is offered a choice of fares, the driver has a reputation to uphold and the user can use the app to choose, book, ride, pay and leave a review. With just one push of a button anywhere in the world, users have an affordable taxi with a friendly driver at their disposal.

However, the instrumental view does not stand up once we realise that Uber changes the relationships between people and organisations and raises new questions. The taxi driving profession is changing due to the advent of a new technology. Since Uber offers such a great user experience, which is also cheaper than conventional taxis, Uber has penetrated a large part of the taxi market. Many taxi drivers now drive for Uber. However, these drivers are not employed by Uber, but instead work as freelancers. This means that Uber does not have to pay any insurance premiums and it is difficult to verify whether an Uber driver is complying with regulations on driving hours and rest times. The drivers are on call and have to be available whenever possible. Drivers sitting at home receive a message asking whether they would like to work, as it is very busy at that moment. Drivers are prompted by the app to work more. The question is whether this is good for safety on the streets.

Uber's goal is market dominance. It works just like the big supermarket chains. First drive out the small neighbourhood supermarkets and then you can set your own prices according to what people are willing to pay. It remains to be seen what the user experience will look like once Uber has gained its dominant position in the market. Will Uber optimise prices for users or will it maximise profits? As we can see with content creators for Youtube, one change in the algorithm can mean a lot for those who earn their livings through platforms like these. We can see here that the living environment is defined by these kinds of platforms. Technology and its systems are changing society faster than people are able to adapt. You could say that the system defines/determines what a human being is in these cases.

Peter-Paul Verbeek

1.3 Peter-Paul Verbeek and mediation theory

Verbeek (1970) says that a philosophy of technology should look at how different technologies shape the interaction between people and objects. He derived four of these forms of interaction from the philosopher Don Ihde, who described four ways in which technology, man and the world mediate between each other (Verbeek 2000, p. 141-44). Firstly, we speak of an embodiment relationship when technology forms a bond with the human body. This is the case, for example, with glasses. A person wearing glasses does not look at the glasses, but through the glasses at the world. Virtually the same thing happens in a hermeneutic relationship, only the technical object does not 'disappear' in the process of mediation, but instead provides an interpretation of the world. This leads humans to perceive the world in a particular way. A thermometer, for example, provides humans with an interpretation of the temperature, but not a direct perceptual experience. The third form of mediation through technology occurs in the alterity relationship: a technology represents an 'other' in the world with which humans have a relationship. For example, a car or a computer has an autonomy with which humans can interact, but if everything is working as planned, the technology has no will of its own. Most automatic technologies fall under this category. Finally, we have a background relationship. In this relationship, the technology does not play a central role in perception, but influences the context of perception in the background. For example, the central heating system heats the room unnoticed, but it determines the way people are able to function in that room. These four ways of interacting with technology have been extended by Verbeek to include interaction with the latest technologies. This itself is further proof that both humans and technology are constantly changing in how they interaction with each other.

Verbeek sees three new possible relationships. In the case of a brain implant, humans and technology merge to such a degree that the boundaries are difficult to define. We speak of a 'cyborg relationship' when the connection becomes even more intimate. In a 'smart environment' there is constant interaction between users and context. Unlike in a background relationship, the technology persistently responds to the user's behaviour. The world and technology fuse together, forming a whole that responds to users. Here, Verbeek speaks of 'immersion'. Thirdly we can speak of 'augmentation' with technologies such as Google Glass or Pokémon Go. These technologies combine the embodiment and hermeneutic relationships with information about the world on parallel screens (Verbeek 2015, p. 20-30).

These diverse possible relationships show that technology, people and the world can interact in different ways. One singular analysis is not possible as there is no one singular relationship. The following example shows what implications this has for our understanding of the human subject, which in turn affects how we use ethics to determine what we consider to be right or moral in a given situation.

Example: The ultrasound as a constituent technology

A sonogram, popularly called an 'ultrasound' is good example of a technity: an image, based on sound waves, of a fetus in the womb. Ultrasonic images (also: ultrasound scans) have been produced since the 1980s, and are now a standard part of routine pregnancy counselling in our healthcare system (at least after 12 and 20 weeks). It is also a cause for celebration among family and friends. On the other hand, it is also true that ultrasounds sometimes lead to fear and disappointment among parents-to-be.

(Verbeek, 2014) discusses how a technology like an ultrasound partly constitutes a new reality and raises new ethical questions. Because ultrasounds shift our norms and responsibilities toward unborn children, we have to ask ourselves the question of when and how we want to deal with unborn life. Technology therefore plays a mediating role. The ultrasound scan is not simply a new way of making an unborn child visible to the parents. The technology actively shapes the way the unborn child has a place in their parents' lives. It presents the parents with ethical choices, and the process of making these choices is influenced by the technology.

The way the ultrasound displays the unborn child determines how it is interpreted by the parents. The fetus is depicted much larger on the screen than it really is. Moreover, the fetus is depicted separately from the mother. It is in the womb, and to this extent inseparable from the mother. But this is not visible on the screen. This part of the context falls away. Due to the enlargement of the small clump of cells and its being set apart, the unborn child acquires the status of a separate independent entity with its own identity. Consequently, an ultrasound presents the fetus as an individual person, rather than as being part of the mother (Verbeek 2008, p. 16). Furthermore, Verbeek states that the unborn child not only becomes a person, but a patient. The health of the fetus can be assessed using a range of analysis techniques. Existing and potential abnormalities can be determined at an early stage. As a result, the unborn child suddenly becomes something the parents have to make decisions about.

Through technology, a new relationship between parent and unborn child is created. Because the unborn child is represented visually, it acquires more meaning in the lives of both parents, whereas the bond used to be unique to the mother. Because the mother is represented as separate from the child, she can increasingly be seen as an environment in which the child is created. Ultrasonic images therefore lead to the mother and her lifestyle being monitored, so that she provides a good environment for the child. The most important aspect for ultrasound technology is that it also ensures that parents are now decision makers about the life of their unborn child (Verbeek 2008, p. 17).

The image of the fetus is a techniteit that, on the one hand, already gives the unborn child an independent 'life' that can be shared with others. On the other hand, it initiates decisions based on the physical/medical condition of the fetus that becomes visible through the ultrasound. From this, Verbeek draws the conclusion that to some extent, technology determines how people act ethically. The question is whether we should perceive technological objects as moral agents, as they play an important role in the moral decision-making process.

1.4 Conclusion

For a long time, the instrumentalism and determinism were considered decisive when analysing technology. However, new developments have put these views under pressure. In contemporary times, we see that technological applications are becoming increasingly intertwined with humans. Technology is being refined and is getting closer and closer to humans. As a result, people are becoming increasingly connected to technology. A philosophy of technology is developing that assumes that one cannot be defined without the other. Humans cannot be defined without technology and vice versa (Becker, 2015, p. 24-25).

Mediation theory from Peter Paul Verbeek fits in well with this. Verbeek explains how humans and technology mutually define each other. He interprets this by concluding, based on empirical research, that various forms of interaction are possible between humans, technology and the world, and he further elaborates on these forms. If you compare this with Heidegger's determinism, you could call it compatibilism. Compatibilists assume that free will exists regardless of whether determinism is true or not. Determinism and free will are not mutually exclusive (Wernaart, 2020).

From the viewpoint of mediation theory, it can be concluded that ethics is not determined solely by humans or solely by technology but by the relationship between humans and technology. An ethical framework therefore will have to provide for the possibility of distinguishing between different applications of a technology in different contexts. We will take a look at this in the next section. We will consider how technology can be used to promote human well-being, while taking into account the fact that what a human being is subject to changes through technology.

In the following chapters, we will look at how ethics can be used in practice to design technology aimed at promoting human well-being. It is important for us to take into account the fact that the application of a technology is context-specific. We will therefore have to apply ethics 'from the inside' so to speak, and not from the outside as is often the case in ethical discussions.

SECTION 2

FROM THEORY TO PRACTICE

In the first section of this paper, we discussed a number of philosophical currents that address the relationship between humans and technology. We zoomed in on instrumentalism versus determinism, explained why these classical forms of techno philosophy are no longer suitable for the current times and as an alternative, compared them with Peter-Paul Verbeek's mediation theory/guidance ethics.

However, none of these theoretical considerations provides us with a direct answer to the question of what we should do next. In this chapter of the paper, we will address the question of how we can now connect the theoretical foundations of techno philosophy to the practices of innovation. We are answering the question how we should act in our new technological world so that we can bring the impact that technology has on society in line with our human values. To achieve this, we have first listed a number of basic principles, which we will discuss in more detail later on in this chapter:

- We start from the assumption that technology is not neutral. It is not something separate from us as human beings (as Jaspers claimed in his time) and it is also not something that happens to us and over which we have no influence (if we were to subscribe to Heidegger's theory, see 2.1)
- We are therefore using Verbeek's mediation theory as our guiding principle. We assume that technology acts as a mediator between us and the world, and that it also makes up part of that world itself. Like Verbeek, we argue that we should not judge technology, but rather guide its development in the appropriate way (2.2).
- We also express an opinion on how we would like to conduct ethical discourse within the context of an institution of higher professional education (HBO) (you can read more about this in Section 2.3).

In addition to these basic principles, there are also a number of potential pitfalls:

- Bias: in order to avoid unconscious and unintended bias, it is advisable to work with multi-disciplinary and/or inclusive teams. And, in order to be able to make products that connect well with the people for whom the technology is intended, it is also advisable to make this group as diverse as possible and to test the (interim) products regularly both within and beyond the most readily identifiable target groups (2.4)
- Regret in the future: even the most well-intentioned tools can lead to different future outcomes than expected. For example, if the technology can be applied in a different context or if human values are not taken into account before launching the products in a human or social context (2.5).

2.1 Technology is not neutral

The basic principle that is now shared by virtually all scientists (with a few exceptions) is that technology is not neutral. We subscribe to this view. Technology is not just something that happens to you. When you create (something using new) technology, which happens constantly in our study programme, you have the responsibility of considering what we will do with that technology and what it will do or could do to us. On the one hand, we are creating technological applications, such as apps for smartphones and applications for VR glasses and self-driving cars. On the other hand, this technology is also part of the world that surrounds us and helps shape how we live, perceive, act and think in this world. Therefore, we assume that technology acts as a mediator between us and the world, in a world of which it is itself a part.

Example: technology that fits in your pocket

Be it a gun or a mobile phone, much of technology today has become so small and portable that you could essentially carry it in your pocket. There is a law in America, the Second Amendment to the United States Constitution (part of the Bill of Rights), that was added to the Constitution on 15 December 1791. It prohibits the government from violating the natural right of citizens to own and bear arms. This means that every American could potentially own a gun (in practice, one in five Americans actually carries a gun on a daily basis). This has more consequences than you might initially think. Even if someone has no intention of using a gun, the sheer notion that someone may be carrying a gun does something to the relationship between people. It can make people more wary and/or more suspicious of each other. And... if we look at the statistics of mass shootings in schools (a statistic that while non-existent in other countries, is unfortunately still on the rise in America), the threshold for using a gun seems to have been lowered by the Second Amendment. Although it may surprise you, it is actually no different with your mobile phone. Research shows that the mere presence of a mobile phone is so distracting that we are finding it increasingly difficult to concentrate on anything else for an extended period of time without the incessant desire to check for new messages. Therefore, while we may very well make decisions about technology, technology also has a very strong influence on us, whether we use it or not.

2.2 Mediation theory as the guiding principle

From the perspective of mediation theory, ethics is not determined solely by humans but by the relationship between humans and technology. Technology partly determines morality. Although technology itself cannot make moral choices, it can embody morality (Verbeek, 2014).
For this reason, ethics should not be limited to the question of whether or not a technology is acceptable (a yes/no question), but should rather address the question of how a new technology can be given a place in society and how this will affect human values. This is a means of getting up close to the technology and examining it from the context of its application. In our opinion, this is the best way of creating a tool for lecturers and students in an HBO ICT study programme. Hence, the question we should be asking with new technology is not: 'Are we for or against it?' but 'How will we design and apply technology so that it promotes our well-being and/or at least does not undermine it?'

Example: cyborgs and hybrids

Humans and technology are becoming increasingly intertwined (see 1.3). At times, this results in the line between humans and machines being blurred. People who wear glasses see the world through them as others would see it without them. For someone who wears strong prescription eyeglasses, it is virtually impossible to manage without optical aids. These people probably feel more complete with their glasses than without them. People with pacemakers or hearing aids are also cyborgs, according to Haraway's 1985 essay A Cyborg Manifesto. Artist and cyborg Neil Harbisson once took the idea to a whole new level and voluntarily had an antenna implanted in his head. This allowed him to partially compensate for his colour-blindness and receive telephone calls and satellite images directly into his head. Now, this may sound a bit extreme, but the question is what we will consider normal in the future as it is growing more feasible for our bodies to become increasingly engineered. Will we want the Instagram filters that make us more beautiful to be applied in real life (via plastic surgery or fillers, for example)? Will a potential top athlete in 2050 be prepared to have his/her lower legs amputated as soon as he/she realises that he/she will be able to run faster with modern, springy sports prostheses than without them?

Verbeek's technology analysis shows that being intertwined with technology turns us humans into hybrids. Consider for a moment what else might be possible with glasses, virtual reality goggles, Google Glass or contact lens implants (and imagine a future where these technologies can be combined). ecause technology turns us into hybrids, technology also affects ethics itself. Ethical frameworks shift in response to technology. A good example of this is with the introduction of technology for prenatal screening, as we saw in section 1. For a proper ethical discussion on technology, we should therefore not only ask whether it goes too far (yes/no), but also in what way technology itself influences our values.

2.3 The ethical discussion in higher professional education (HBO)

The question is what approach should be taken in ethical discussions within our higher professional education (HBO) programmes. Both lecturers and students play an important role here. It starts with awareness; recognising human values; asking yourself whether they are the focal point or if they are being threatened. Peter-Paul Verbeek contends that the main task of ethics is not so much to judge as to guide technological developments. This means getting under the skin of the technology itself. Not by applying ethical frameworks to technology from the outside, but by exposing ethical questions from the inside. This pertains to a kind of guidance ethics that is used during the design and development process to question the technology in its specific context of application from the perspective of human values. This is in stark contrast to judgement ethics that only is used at the end of the process to examine whether the application of the technology clashes with ethical standards and boundaries.

This also means that it is necessary to start the ethical discussion at the idea, concept and design stages. Ethics should be seen as a guiding force throughout the entire process. We use ethics to shape our existence in relation to technology. We take the quality of the interaction between humans and technologies as the starting point for designing and constructing those technologies.

From the point of view of the intended quality of human existence and human values, the most important question is therefore: what is the best way to make new technologies accessible to people and to integrate them into society? In this context, Verbeek speaks of 'the good life' as understood in classical Aristotelian ethics (Verbeek, 2014 pp 160).

Like Peter-Paul Verbeek's guidance ethics, we advocate a form of ethics that is not based on 'judgements' but one that can more accurately be seen as a normative 'guidance' of technology in society. At the same time, ethics can also guide society in dealing with technology. Such an approach does not place ethics outside of technology, but right in the middle of it. That means that ethics is not primarily concerned with whether a technology is acceptable or not, but with whether and under what conditions a technology can be given a responsible place in society. The central question in guidance ethics is not 'yes or no?' but 'how?' It does not focus on rejection or acceptance, but on the design, implementation and use of new technology based on values.

In order to have a meaningful discussion, we believe it is important to ask a lot of questions. In our opinion, it is not the role of a higher education institution to determine what students should think or to fill in the answers to these questions for them, but rather to facilitate critical thinking. To do this, we have designed a toolkit with questions in several different categories that not only address internal values and questions that ICT practitioners are naturally inclined to focus on (Does everything work?

Does the technology do what it is supposed to do? Are there any bugs? etc.), but also on external values such as privacy, inclusiveness and sustainability. The toolkit is action-oriented. It is not without reason that each category is followed by the question: 'Now that you have thought hard about how bad actors can impact this technology, what improvements would you like to make?' We will go into this in more detail in Chapter 3. But we will first elaborate on the process that should precede this question as well as the pitfalls that could be encountered.

2.4 Pitfall: inherent bias

Much of technology has been and (still) continues to be developed by a fairly homogeneous group of mainly highly educated white men. Take a look at the workforce at an average ICT company or at the average student following the Fontys ICT study programme. The world view (and therefore the moral implications!) that this group represents (consciously or unconsciously) is incorporated into the technology they design. Partially because of this, there has been a tendency to use well-educated white men as the focal point and the benchmark, as a result of which other people (such as women, different-minded individuals, people with a different cultural background) are more likely to be overlooked. This may seem harmless, but it is not.

As early as 1977, Carol Gilligan wrote about the phenomenon of the female perspective being under-represented in moral theory. In her book 'invisible women' from 2019, Caroline Criado Perez presents several examples of technology that (eventually) proved to be racist or that worked better for men than for women, thereby further increasing inequality of opportunity. Our own Rens van der Vorst also makes this clear in his YouTube video 'A paradise for Nerds'. And Cathy O'Neil expressed in a TED Talk that algorithms are actually opinions packaged in code. If we recall the discussion on whether technology is neutral or not (see Section 2.1), you may understand why this is problematic.

One way of preventing unconscious bias from being designed into technology is to ensure that the teams developing the product are diverse enough. Contrary to what you may think, student teams by their very definition are not diverse. So you may want to consider adding outside people to a student team, for example from the companies the school works with.

Another way of avoiding bias is to survey a wider group of people than those for whom you initially conceived the product. This also prevents people from feeling excluded or unheard later on. And, you might even come up with some new ideas!
That is never a bad thing, as it can only make your product better.

2.5 Pitfall: subsequent regret about something that now appears positive

Even the most well-intentioned tools can still cause regret in the future. This can happen, for example, if the technology can be applied in a different context or if human values are not taken into account before the products are launched in a human or social context. If the values that developers want to embody in their technological creations do not correspond in the end to the values that will ultimately be affected (for better or worse) in society, we call this 'failed value alignment' (Kamp and Wernaart, 2021).

We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run – Roy Charles Amara -

One of the most striking examples of technology regret came from Tim Berners-Lee, the man who created the world wide web. He has seen his creation completely transform over time, from an open platform where anyone could share information to one full of fake news and mass surveillance. In 2009, he set up the World Wide Web Foundation in order to protect human rights in the digital landscape. Berners-Lee is currently working on a new platform, Solid, with the aim of reclaiming the web from corporations and returning the concept to its democratic roots (Brooker, 2018).

And this is not the only example that exists. Mark Zuckerberg most likely did not invent Facebook with the intention of manipulating elections; Jack Dorsey and the other Twitter founders certainly did not intend to give Donald Trump a digital megaphone. And the founder of 8chan, one of the darkest corners of the internet, expressed his regret after the shooting at the mosque in Christchurch, taking responsibility for the potentially controversial role the platform may have had in this case.

Regret can never be completely prevented, but you can anticipate it by asking yourself what could happen now and in the future with the technology you envision (see also the Future category in the Technology Impact Cycle Tool that we introduce in Section 3.3).

SECTION 3

A PRACTICAL TOOLKIT

Now that we have decided on the best way to conduct ethical discourse, it is time to work towards a practical method of addressing ethical questions. You can read about it in this chapter. But firstly, we will discuss a number of preconditions that need to be in place in order to achieve positive end results:

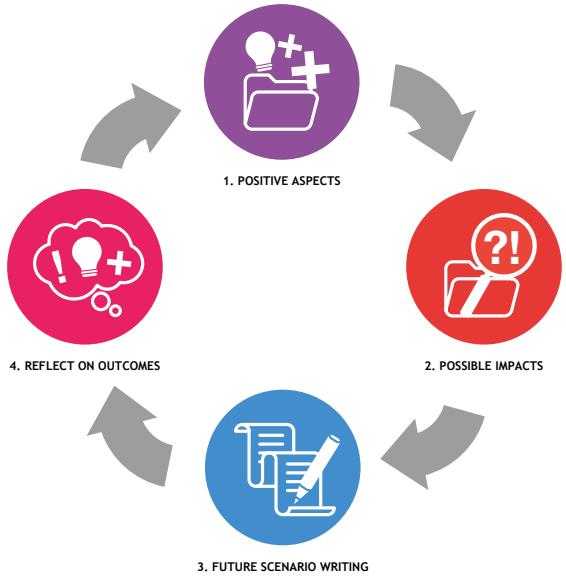
- In our opinion, ethics should not be seen as a showstopper, but rather as a driving force for innovation. This can be achieved, for example, by asking ethical questions during several phases of the design process in order to improve the quality of the end product (3.1).
- The moral design process is part of context-driven applied ethics: each technology must be considered in its own context. If the context changes, the ethics also change (and therefore the cycle needs to be repeated, see 3.2).
- The Technology Impact Cycle Tool at www.tict.io is an example of a moral design toolkit. We will look at this in more detail in Section 3.3.

3.1 The cycle: posing ethical questions at every stage of the design process

In our opinion, ethics should not be seen as a showstopper, but rather as a driving force for innovation. A lot of design processes consist of several phases, such as the start, middle and end phases, plan-do-check-act, several iterations for scrum, or the empathize-define-ideate-prototype-test phases in design thinking. By asking ethical questions during each phase of the design process, you give yourself the opportunity to continuously adjust your product, thereby improving the quality of the final product. We see the moral design process as a circular, recurrent process that enables us to not only look beyond internal values (Does it work? Does it do what it is supposed to do?), but also to internalise external (end) values such as privacy, transparency and sustainability in the product.

As far as we are concerned, there are no right or wrong answers to these questions (see also Section 2.3). You can answer as you see fit. Despite the fact that questions can sometimes have a moralistic aspect, you can also choose not to answer them, to ignore them or to answer them in your own way. The important thing is that you have indeed thought about them.

If this is done in cycles, it is important to always map out both the positive aspects as well as the potential risks. Working out some (perhaps even extreme) future scenarios can be beneficial here. For example, you can ask yourself what could happen in a utopian or dystopian scenario 50 years from now? And then ask yourself if that is the kind of world you would want to live in at that time. In the end, of course, it is all about weighing up and balancing moral dilemmas.



In the next phase of the design process, the cycle begins again.

3.2 Context-driven applied ethics: the context determines the ethics

Any given technology has to be considered in its own context. This involves the interests of all the stakeholders: the designers, developers, users, companies, policy-makers, etc. Designers and developers can analyse, foresee and assess the effects of technologies on our existence based on the specific case they are working on. Despite the fact that designers will certainly not always be held personally responsible for all of the decisions made concerning new technology (the moral authority may lie elsewhere, for example with a board of directors, a council or a government), designers can nevertheless consider the possible consequences that a technology may have and (partially) assume that role and/or encourage others to think about it, too.

But... if the context changes (for example, consider how we thought about smoking in public spaces 20 years ago and how it is viewed today), then the entire framework changes as well and the whole process of thinking about the impact begins anew. And... what we find perfectly normal today (having a drink with colleagues after work) may well prove unacceptable 20 years from now. This means that a new case in a different context always needs to be examined again, although we can certainly learn from similar cases in the past.

How do you design a practical toolkit for students and/or engineers?

Before developing our own toolkit, we looked at existing theories and toolkits already on the market. We noticed that many of them were either too specific (e.g. mainly focused on data or privacy, such as Data Ethics Decision Aid ((DEDA), n.d.) or too focused on one topic, e.g. privacy (Hoekman, 2020)). Others were too broad (e.g. the United Nations Sustainable Development Goals, which we believe are too vast to comprehensively address within the narrower context we are considering with students) or too theoretical (from a philosophical perspective, which often left the practical question of what decisions should be made based on them unanswered). And still others were too negative (e.g. Ethical OS (Institute for the Future and Omidyar Network, 2018)). The latter toolkit, while very practical, focuses primarily on risk (seen as a threat to external values, with the intention of not regretting the things you have done). Although this can be useful, if you focus only on the risk, the danger is that you may only see the negative impact and may be tempted to think that the world will end because of technology. None of these perspectives aligned perfectly with our aims. We therefore decided to draw on the wisdom of others and build our own toolkit accordingly (and incorporating all the others!).

- The MOOC of the University of Twente (2017) and the works of Van de Poel and Royakkers (2011) and Rijnboutt and Heerink (2020) taught us about several theoretical perspectives that provided us with a philosophical approach to examining ethical dilemmas.
- The Ethical OS (Institute for the Future and Omidyar Network, 2018) from Silicon Valley showed us how to turn this kind of philosophical theory into a practical toolkit. It also taught us how to use speculation about the future to choose a strategy of incorporating lessons learned and best practices.
- From Spiekermann (2015), we learned about human values, and that building future scenarios and telling stories can help us imagine all the possible scenarios of the future.

Based on these insights, we added the categories of impact on society, data, criminal actors and future to our previously defined categories of human values, privacy, transparency, inclusiveness and sustainability to further broaden our perspective. When we combined all of our insights, we realised that external values can be just as important as technical (internal) values. Consequently, our toolkit not only focuses on developing a broad perspective of the positives (the desired impact on society) but also on the negatives (adverse effects). The challenge was then to balance the positives and negatives, like yin and yang, as shown in the figure above.

From that point, we ultimately developed a concept of a tool as a cycle that you can constantly return to, and which included the following categories: impact on society, human values, stakeholders (and platforms), privacy, data, bad actors (and alternative reality), inclusiveness, transparency (and AI), sustainability and future scenarios.

3.3 The Technology Impact Cycle Tool

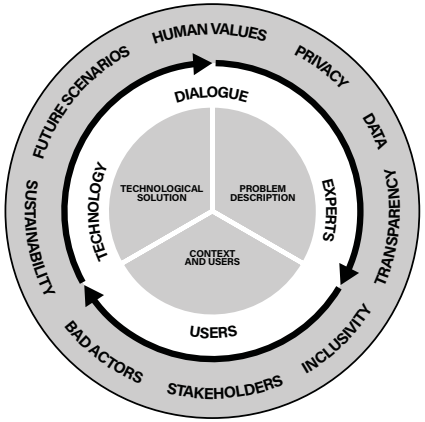
Assessing technology from within a predetermined ethical framework is often inadequate when it comes to facilitating proper ethical discourse as such frameworks are not independent of technology. Ethics and human values are, after all, partly determined by technology and also depend on the context. The content and importance of notions such as privacy, security and transparency are partly determined by the specific way in which technologies challenge those values. Therefore, we require a toolkit that can take a broad perspective while emphasising both external as well as internal values.

When we talk about the relationship between human values and technology, we are entering the realm of ethics. There are already a number of ethical frameworks available created from a range of different perspectives. We found many of these to be either too specific (for example, mainly focused on questions of data or AI) or too negative (for example, by only emphasising what could go wrong, causing only risks to be seen and barely focusing on the benefits) or too much from one particular perspective (for example, a Christian perspective). As this came across as too limiting to us, we have created our own toolkit. Because all of these other frameworks are certainly helpful in their own specific areas, we have created the toolkit so that it is also possible to use it to view them, allowing you to deepen your understanding of these frameworks. Some important frameworks are also listed in the annex to this paper.

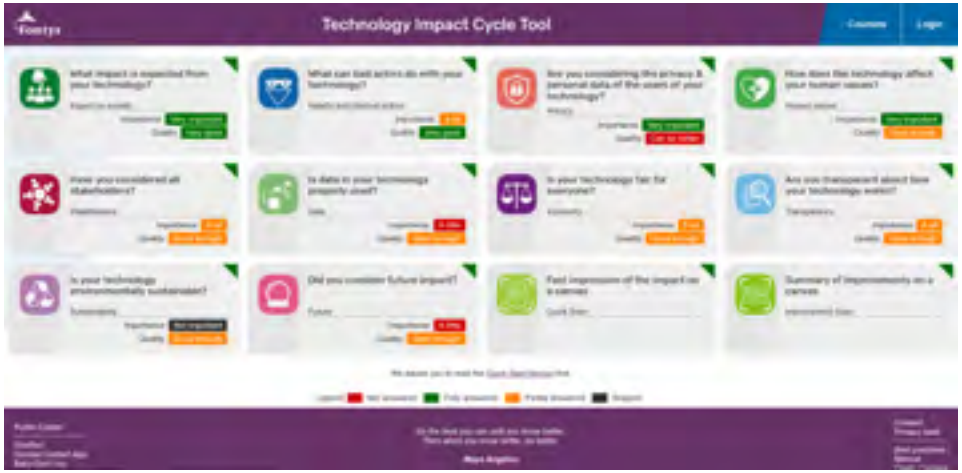
Just as with the methodology map for practical research developed within the HBO-I Foundation (Van Turnhout, K et al (2014)), which we developed for guiding research, we have also attempted to develop a framework with the Technology Impact Cycle Tool (see the following section) that can be of value throughout the design process.

Just as with practice-based (graduation project) research, it is important to first describe and frame the question properly. In the toolkit, we do this for instance by first answering the questions in the category ‘impact on society’ or by first going through the inner ring (everything within the arrows, the so-called ‘small cycle’) in the following diagram:

Once this has been completed, the questions from the following categories can also be added as well as the outer ring of the cycle (the 'extended cycle').



The toolkit looks like this online (at the moment):



Here you can see all of the categories from the full scan, as well as a number of blocks for the quick and improvement scans. When using the tool, you can use colour codes to indicate to what extent you think a category is important and to describe the quality of your answers given. This allows you to quickly find something at a later time that you may need or want to review again in the future.

The Technology Impact Cycle Tool at www.tict.io consists of a total of five main components

1. Scans (quick scan, full scan or improvement scan)

At the heart of the tool are the questions that are asked to determine the impact of (a new) technology. Because we find it important for our students to learn to look at the total impact of a technology, we have divided the questions into ten categories. We paired a specialist from our team (as an ambassador) to each category to ensure that the material is up to date, continues to be improved and serves as the point of contact for anyone with questions or comments. The challenge was to formulate the questions in such a way that they remained relevant to as many users as possible. This process was optimised by constantly testing the questions, collecting and adjusting the feedback and further refining the questions together with students, engineers, professionals and teachers (a never-ending process).

To make the tool accessible, it also offers the possibility of answering only one question per category (the quick scan) or of answering only the questions that relate to the improvement of a certain technology (the improvement scan). After completion, reports can be printed or downloaded as PDFs. A login system allows progress to be saved and enables sharing and collaboration.

2. Open, free, online courses

The second key component is the open, online crash courses offered for each of the ten categories. To be able to properly reflect on the impact of a technology, you need to be inspired and have all the tools necessary for critical thinking. The masterclasses we have created are offered as ten open online courses that can each be completed in about an hour. The courses have been developed and tested in educational settings, together with professionals, students and a team of teachers.

3. Best practices

The third component is best practices. We have created the tool so that it can be used in any type of educational setting and in any form. From short, incremental, to complete and comprehensive. We have identified a number of ways in which we believe the tool works best. We have compiled the best practices in order to provide some examples of how the tool can be used. These have been divided into specific roles that users can assume (such as the Designer, the Teacher and the Critic).

All of these best practices stem from our own practices and range from a teacher organising a one-hour workshop to raise awareness and a designer improving his product by using the tool for half a year (and in several cycles), to a journalist wanting to write a critical article about the impact of technology on our society.

As an example: when we tested our toolkit on journalists, we found that they were a bit hesitant at the beginning to ask critical questions about technology, knowing that their own knowledge may not be up to speed at that point. We noticed that using the questions in the toolkit helped them to regain their confidence as they were able to ask questions that had been formulated in advance. This broadened their perspective while at the same time reduced the chances of overlooking important issues (Arets et al,l 2019).

4. Supplementary (lesson) materials

The fourth component consists of additional (teaching) material. The TICT offers inspirational material, exercises as well as links to other frameworks and publications. The tool also offers a number of completed example cycles for inspiration (such as for a griefbot and an app to analyse the crying of a baby). This also makes it a true platform of exchange for anyone interested in thinking about the future of technology. Or in fact for anyone who wants to contribute ideas!

5. Community building

As a fifth important component, the tool helps to facilitate a community. Any user can make their own answers (in TICT we call them cycles) available to the community, which allows users to inspire other users and to respond to each other's analyses. You can also meet and get in touch with the ambassadors of each category via LinkedIn.

All in all, the TICT has an impact in many different ways,

for example on:

- Students who create technological applications with the aim of improving society: after working with TICT, they are able to think in broader terms and in a more structured way about the impact of their solutions;
- Students who use technology in their professional practices: they are given tools to consider the effectiveness of their technology;
- Students who need to be able to look critically at technology (such as journalists, nurses, managers): the tool helps them ask the right questions;
- The many teachers who want to add 'something about ethics' or 'something with impact' to their lessons have been given the tools to do so: the open, online and free courses combined with best practices, for example, offer the freedom and the tools to work hands-on with students;
- The professional field that works together with Fontys is encouraged to use the toolkit to closely examine their own products and to come up with new and ethically well-thought out solutions that benefit them both now and in the future.
- Anyone who wants to learn more about their relationship with technology now has accessible, inspiring courses at their disposal.

Offering the toolkit openly and at no cost was a deliberate choice. We believe that the toolkit can have more of an impact if unrestricted access is granted to everyone, perhaps in surprising ways that are yet unknown to us.

We certainly hope that initiatives like this will contribute to a world where moral impact is not just a word, but also a call to action: let's make an impact together by constantly building the future we want to live in ourselves!

It takes only a tiny group of engineers to create technology
that can shape the entire future of human experience with incredible speed – Jaron Lanier –

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