RESPONSIBLE INNOVATION IN A TECHNOLOGICAL SOCIETY

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Responsible Innovation in a Technological Society

Examining the conceptual challenge of Responsible Innovation through an Ellulian perspective[1]

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"Man in his hubris -above all intellectual- still believes that his mind controls technology, that he can impose any value, any meaning upon it. And the philosophers are in the forefront of this vanity."

Jacques Ellul, *The Technological Society*

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I am unsure if someone will actually ever read these acknowledgements, or whether my thesis will forever diffuse in the PSTS-database. I therefore find it somewhat funny to write them, and it feels more formal than it should. But, I do want to express my upright thanks to some people. This thesis has been a 'bevalling' (going into labour) for me, as we Dutchies like to say (sorry for the man-like tendency to claim to know the pain of going into labor). Anyway, this thesis was not the easiest and most fun thing I ever wrote, due to an endless collapse of factors in my personal and professional life. There are some people that stood by me during this collapse, and I am very grateful to you. Thanks for lending your eyes and ears to me when I needed it.

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Summary

This thesis aims to get an understanding of the conceptual challenge of Responsible Innovation (RI). This challenge entails that the concept of innovation is not or vaguely defined in RI, even though the conceptualization of innovation is epistemically and politically relevant. In the current literature, this challenged is addressed, but not sufficiently explained and explored. Moreover, even though there is an aim in RI to move beyond a techno-economic concept of innovation, innovation is stuck in a techno-economic paradigm. The key objective of this thesis is to understand the conceptual challenge, and specifically to examine why the conceptual challenge implies a concept of innovation that operates in a technological paradigm. A second objective is to examine the consequences of this technological paradigm of innovation are for the aims of RI. I choose to use the philosophy of Jacques Ellul to accomplish these aims, because he has provided an argument for understanding why the modern human conceptualizes the world in a technological way. The research question is as follows:

How can an Ellulian analysis help us to understand the conceptual challenge of 'Responsible Innovation' and reveal its consequences for RI?

I argue that studying the history of the concept of innovation through this Ellulian lens, reveals that innovation is conceptualized in a technological paradigm, because humans are nowadays conceptualizing their relation to the world through a technical lens. The contemporary concept of innovation has the characteristics that Ellul identified as characteristics of a world that is determined by technique. This shows why innovation is operating in a technological paradigm, and it moreover shows why it is so hard to move away from this paradigm. Since technique has power over our thinking, it is hard to move away from it. I however concluded that it is not impossible, because the fluidity of the concept of innovation throughout history suggests otherwise. Change is possible in the future. But, as long as RI suffers from the conceptual challenge, and does not reflect enough on the concept of innovation, it will remain to operate in a technological paradigm. Moreover, that the self-justifying nature of the current concept of innovation is keeping us from justifying why something is conceptualized as an innovation in the first place, and that it renders the development of new technologies as a neutral given. I substantiate this claim by going over a case study on *Responsible Killer Robots*, where I showed that the development and existence of such robots is taken for granted, and that a teleological justification of the innovation is absent. The same goes for other RI-projects. Taken together, I argue that the current concept of innovation suffers from a strong techno-optimistic bias, and this translates itself into the ethical evaluation of innovations too. It is uncritically assumed that innovations are technologies, that technologies are necessary for progress, and that the development of these technologies is a neutral given. This is problematic, because there is not enough awareness and reflection of this optimism.

Introduction

In 1548 England, King Edward IV passed a law against innovators: *Proclamation Against Those that Doeth Innovate* (Godin, 2015, p. 281). Innovation became forbidden by law and innovators could end up in prison. In our time, 2022, innovation enjoys quite a different reputation. In 2017, the report *Why Do We Need an Innovation Union?* was published, that stated that the EU needs to be among the top innovators in the world (European Commission, 2017). The intergovernmental organization The Organization for Economic Co-operation and Development (OECD) wrote in 2010 that "most current social, economic and environmental challenges" can be solved with innovations (OECD, 2010). Our age can rightfully be described as 'the innovation age' (Godin, 2015, p. 3).

At the same time, awareness of possible negative effects that innovations might cause, such as climate change (Huesemann & Huesemann, 2011), threats to democracies (Settle, 2018), and socioeconomic inequality (Naudé & Nagler, 2016) is rising. For this reason, the European Union launched their Responsible Innovation (RI[2]) framework in 2011, as part of the 'Horizon 2020' (von Schomberg, 2013, p. 1).

The goal of RI is to steer the innovation process in a responsible manner so that innovations become ethically acceptable, sustainable, and socially desirable (von Schomberg, 2022, p. 11). Moreover, RI aims explicitly at moving away from a techno-economic dictated concept of innovation (von Schomberg, 2022, p. 86). For instance, Owen and Pansera call for alternative conceptions of innovation that do not follow the demands of market-based competition (2019, p. 41). They argue that innovation conceptualized as commercial technologies does not sufficiently take the public good into account. When the development and success of new innovations is determined by their success on the market, ethical issues can be lost out of sight. An alternative conception of innovation, one that incorporates public values, can help to keep an eye on ethical issues.

Responsible Innovation is now one of the pillars of the European Union (European Commission, 2015). In the Netherlands there is a whole Netherlands Council for Research (NWO) program dedicated to it with (MVI) with more than 70 government-funded projects. So, the European Union is allocating time and money towards increasing the acceptability, sustainability and desirability of innovations.

However, RI does not come without its challenges. Even though there is a clear aim to move away from a techno-economic concept of innovation, it has appeared difficult to do so. For example, the project *Responsible Killer Robots?* starts from the premise that "Modern warfare is impossible

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[2] This framework is interchangeably referred to as Responsible Research and Innovation (RRI) or Responsible Innovation (RI). Since this thesis will focus on innovation, and since RI is a subset of RRI, I will refer to it as RI consistently.

without advanced information-based decision support systems." (Miller, 2015)[3]. Starting from this presumption, the researchers focus on the ethical issues that may arise when these killer robots are applied (such as responsibility gaps and unintended civilian killings). They propose that we need to include responsible design into these systems, to ensure their efficiency and simultaneously *limit* the damaging effects.

The starting premise from this RI-project seems to suggest that the development of killer robots is inevitable, and that RI must focus on mitigating their damage. Besides their apparent inevitability, there is no other justification for conceptualizing killer robots as innovations. This lack of conceptual justification raises the question what is actually meant by innovation in RI. The argument 'killer robots will be developed' seems to be at odds with the aim to move away from a techno-economic concept of innovation, because it is unclear if the development of the innovation is based on other incentives besides techno-economic incentives. It seems then that this project is applying RI to 'innovation as usual'. The lack of conceptual justification thus raises two questions. First, what is meant with innovation in RI, and second, why can RI not move away from a techno-economic concept of innovation?

A recent explanation to these questions comes from Lucien von Schomberg, who has raised the *conceptual challenge of RI* (Von Schomberg, 2022, p. 36). His point is that innovation in RI is defined vaguely, and that it still presupposes a technological and commercial understanding. This conceptual vagueness is at odds with the aim of RI, namely, to steer the innovation process in a responsible direction and to move away from a techno-economic concept of innovation. Indeed, if we look at the example of *Responsible Killer Robots,* it seems to be the case that the socially desirable future must be one with killer robots. By not justifying why killer robots are seen as an innovation, and what is meant by innovations in the first place, RI remains stuck in a techno-economic paradigm. The conceptual challenge of RI thus has social and political relevance. If the aims of RI are to be achieved, it is important to take an explicit stance on the meaning of innovation and why certain technologies or services are seen as innovations.

L. von Schomberg raises the conceptual challenge, and this is valuable. However, merely raising the challenge is not enough. An explanation of the challenge, i.e. why RI is facing it, is lacking. Moreover, L. von Schomberg does not map out the consequences of the conceptual challenge for the aims of RI. This is problematic, because understanding the conceptual challenge and mapping its consequences is necessary if we want to find a solution for it. There is thus a need for a deeper and understanding of the roots and consequences of the conceptual challenge. As said, a response to this challenge is also socially important. The future of the European Union is, partly, determined by innovations and the way that they are evaluated. In this sense, there is urgency involved in these

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[3] For a full list, see https://www.nwo-mvi.nl/projects?field_themes_tid%5B%5D=7

questions. In other words, it is important to get a proper understanding of the conceptual challenge of RI. Moreover, it is relevant to research how the conceptual challenge is affecting the aims of RI.

This thesis will take understanding the conceptual challenge and its consequences as its key objectives. However, I will not cover the conceptual challenge fully, since this would be too much to do in one project. As I wrote earlier, innovation is now implicitly understood in commercial and technological terms. There is attention in the literature on the 'commercial' side of innovation (Von Schomberg, 2013; Owen & Pansera, 2019; Von Schomberg & Blok, 2019; Von Schomberg, 2022). However, there is research lacking on the technological side of innovation. Even though L von Schomberg notices that 'other forms' of innovation, such as social innovation and behavioral innovation receive little to no attention in RI (Von Schomberg, 2022, p. 36), he does not go into the reasons that we seem to be unable to think beyond a technological concept of innovation. That is why I will focus on the *technological* side of the conceptual challenge and leave out the economic side.

In order to research the technological side of the conceptual challenge, I will turn to the work of Jacques Ellul in this thesis. In his book *The Technological Society* (1964) Ellul argued that the relationship between humans, society, and the world has become machine-like since the Industrial Revolution. I believe that his argument can be read as a phenomenology of the technical state of mind of the modern human and can thereby provide a deeper understanding of the conceptual challenge of RI. Even though his work has gone out of fashion in philosophy of technology, I believe that common objections against him of essentialism and determinism are unfair and make a strawman out of Ellul's argument. Because of his sociological and empirical approach, I give him a chance in this thesis to help me answer the following research question:

How can an Ellulian analysis help us to understand the conceptual challenge of 'Responsible Innovation' and reveal its consequences for RI?

To answer this research question, I provide three chapters that all answer one or more sub-questions of my research question. That is:

1.
    a. What is the conceptual challenge of RI
    b. and which conceptualization of innovation is currently implied in RI?
2. How can Ellul's Technological Society be interpreted to understand the conceptual challenge of RI?
3.
    a. Why is RI stuck in the conceptual challenge
    b. and how does this affect the aims of RI?

Outline

In chapter one, I will explain the conceptual challenge in more detail, and explore the current implicit concept of innovation in RI. This chapter mainly functions as a literature review, and to clearly state the problem that I address in this thesis. I agree with L. von Schomberg and Vincent Blok that innovation is operating in a techno-economic paradigm, but also criticize them for not going further than merely observing this. I By doing so, I show that there is a need to research the 'technological side' of said paradigm more extensively.

In the second chapter, I will turn to the philosophy of Jacques Ellul, who argues in his work that 'modern technique', broadly understood as the combination of all machines and machine-like practices has become a determining factor in the relationship between humans, society, and the world. According to Ellul, we approach everything nowadays through a technical lens. I turn to his philosophy because it can explain why innovation is uncritically conceptualized in a technical manner. The second chapter will function as an explanation and interpretation of Ellul's main argument that he put forward in *The Technological Society* (1964).

In the third chapter, I will provide an answer to my research question. I ask why innovation in RI operates in a technological paradigm, and how this is undermining the aims of RI. To answer these questions, I apply Ellul's philosophy to the concept of innovation. By providing a conceptual history of innovation, I will show that innovation went from a concept that denoted political heresy into an instrumental technological concept that is associated with progress. Moreover, innovations do not need to serve extrinsic goals anymore in order to be justifiably seen as innovations. I make the Ellulian argument that this change in meaning happened because modern humans understand innovation through a machine-like lens since the Industrial Revolution. The historical timing of the change in meaning and the nature of the change in meaning suggest that the concept of innovation has changed in the way that Ellul described the consequences of what he called 'modern technique'.

I then argue that the current concept of innovation undermines the aims of RI. First of all, it undermines the aim to move away from a techno-economic concept of innovation. I argue that the power of 'technique' over our thinking makes moving beyond a technological concept of innovation very difficult (yet not impossible). Second, analyzing innovation in RI through an Ellulian perspective reveals a strong techno-optimistic bias in RI. Authors like R. Von Schomberg have conceptualized as a neutral instrument or process that is needed for progress. Conceptualizing innovation as such leads to the inability to provide a teleological justification for new innovations, and to perceiving the development of new technologies as a neutral given.

I conclude by summarizing my findings, going over some limitations, and suggest directions for the future of responsible innovation. My thesis can function as an elaborate problem statement, and I hope that future research delve more into possible solutions to the problems that I raise. I argue that

there is more awareness necessary about the conceptual challenge of RI and that there is a need for a more thorough philosophy of innovation. Thereby, I aim to contribute to the academic debate around RI and to contribute in a more practical sense to the manner that innovations are evaluated in the European Union.

Chapter 1: The Techno-economic Paradigm of Innovation in RI

Introduction

This chapter will examine what innovation means in RI. This is necessary to sketch the conceptual challenge of RI in more detail, and to set the stage for this thesis. Furthermore, exploring the current conception of innovation in RI is needed to later examine the consequences that it has on the aim of RI. Therefore, I will start with a short characterization of RI. Then, I will establish the conceptual challenge that RI is facing. I will end this chapter with a section on responding to this challenge by analyzing the concept of innovation in the founding text *A vision of responsible innovation* from René von Schomberg (2013). After situating my findings in recent literature, I conclude that innovation in RI operates in a techno-economic paradigm.

Responsible Innovation

Responsible Innovation is one of the pillars of the European Union (European Commission, 2015), there is a Netherlands Council for Research (NWO) program dedicated to it with (MVI)[4] with more than 70 government-funded projects, and future engineers learn to apply it (with courses in Delft, Leiden and Rotterdam). Also in academic literature, interest in RI has risen over the years. There has been a shift from ELSA (ethical, legal and social aspects of technologies) towards RI (Zwart et al., 2014).

The philosophical literature about RI focuses on two things. On the one hand, there are people working on defining RI, that specifically try to establish what it means to innovate *responsibly* (see for example Owen et al., 2013; von Schomberg, 2013; Frodeman, 2019). On the other hand, there are people working on applying the framework of RI to new and emerging technologies (NESTS) (see for example Fisher & Rip, 2013; Grunwald, 2010; Grunwald, 2019).

It is useful to delve a little deeper into this first strand of literature, that concerns itself with defining RI. The prime *aim* of RI is to steer the innovation process in a responsible or desirable direction (Von Schomberg, 2022, p. 30). This responsible or desirable direction means that innovations must be 'acceptable to society' (Platform for Responsible Innovation, 2022). The outcomes of the innovation process should be ethically acceptable, sustainable, and socially desirable (von Schomberg, 2013). A widely regarded and influential definition of RI has been provided by René von Schomberg, in 2013. He writes:

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[4] See https://www.nwo-mvi.nl/projects?field_themes_tid%5B%5D=7 for an overview of government funded RI-projects in the Netherlands.

Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society). (Von Schomberg, 2013, p. 19)

RI refers to steering both the process and products of innovation in an ethically acceptable, sustainable, and socially desirable manner. The inclusion of stakeholders is central to this undertaking. Ethical acceptability is defined as "respecting fundamental values" (Engelhard et al., 2015, p. 4)[5], or "compliance with EU values and fundamental rights" (von Schomberg, 2013, p. 20). These fundamental values and rights are part of the charter of the European Union (European Union, 2012). Sustainability is defined as meeting the "needs of the present without compromising the ability of future generations to meet their own needs" (Engelhard et al., 2015, p. 4) or "contributing to the EU's objective of sustainable development" (von Schomberg, 2013, p. 20). Social desirability is defined as innovation that may "benefit all without discrimination" (Engelhard et al., 2015, p. 4), or specific normative anchor points of the Treaty on the European Union, such as "Quality of life" and "Equality among men and women" etc. (Von Schomberg, 2013, p. 20). By trying to steer innovations in a responsible direction, RI moves from an ethics of constraints (you should not do x) towards an ethics of construction (towards ethical acceptability, sustainability, and a socially desirable direction) (von Schomberg & Hankins, 2019, p. 29).

The aim for ethical acceptability, sustainability, and social desirability is closely related to the awareness that RI shows about the possible downsides of technological innovation. In RI, the focus on technological innovation and the aim for economic growth that is associated with innovation is criticized and seen as a problem for achieving its aim (von Schomberg, 2022, p. 86). There is for instance awareness that commercial innovations have been the cause of climate change (Huesemann & Huesemann, 2011), a threat to free speech in democracies (Settle, 2018), and a magnifier of socioeconomic inequality (Naudé & Nagler, 2016).

The underlying idea has been well articulated by R. von Schomberg (2013). He argues that the benefits of innovations are demonstrated by the success that they have on the market (Von Schomberg, 2013, p. 5). There are no common moral criteria in the European Union to determine the positive impacts of new innovations. It is rather the case that "Competitors can improve their products through innovation, driven by market demand. Thus, the normative dimension of what counts as an "improvement" is decided by market mechanisms." (Von Schomberg, 2013, p. 5). In other words, the success of an innovation is determined by the success that they have on the market. The more money an innovation generates, the better the innovation is.

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[5] This definition comes from a consensus report on the priorities for innovation in the European Union, funded as a RI-governance project (2015).

Von Schomberg then argues that this is a wrong way to determine the benefits of innovations. Market performance and successfulness of an innovation are two different things and often at odds with each other. Take climate change as an example, where it is quite clear that innovations that were once deemed 'successful' based on market-performance have caused great harm to the environment and are part of the root cause of climate change (Huesemann & Huesemann, 2011, p. 256). Industrialized agriculture, for example, is an innovative business that has great benefits if you reason from a market-performance perspective. It has generated a lot of capital, has made agricultural products widely available, and has kept on growing and expanding because of increased demand (Huesemann & Huesemann, 2011, p. 23). A great innovative process, reasoned from evaluating innovations from a market-perspective.

However, industrialized agriulture is also one of the biggest causes of pollution and contributors to the greenhouse effect (Huesemann & Huesemann, 2011, p. 23). These consequences hardly qualify as successful if other criteria than market performance are considered, such as environmental justice. In this sense, RI is different from previous frameworks like ELSA because it is aware that innovations are not necessarily responsible (von Schomberg, 2022, p. 28). The awareness goes deeper than trying to generate responsible outcomes from innovations. There is also awareness that the very concept of innovation, usually dictated by techno-economic imperatives, needs to be changed. As L. von Schomberg notes: "RI seeks to transform a techno-economic concept of innovation and constitutes a shift towards a fundamentally political concept of innovation" (2022, p. 15).

This call to transform the concept of innovation and move away from a techno-economic concept of innovation is the second aim of RI that I wish to highlight. It means that the concept of innovation must be broader understood than just a new technology that is successful on the market, for this concept of innovation has been the cause of irresponsible outcomes. This then leaves room for a conceptualization of innovation where its success is understood in different terms than market-performance, and where it does not need to be technological. This aim thus calls for a fundamental shift in how innovation is conceptualized.

So, there are two main aims of RI. These are 1) to incorporate the moral dimensions of ethical acceptability, sustainability, and social desirability into the innovation process, and 2) to fundamentally reconsider the concept of innovation that is dictated by techno-economic imperatives.

The process of RI is characterized by a focus on the commitment to be anticipatory, reflective, inclusively deliberate, and responsive (Owen et al., 2013). I will now go over these dimensions in more detail. There is a need for *anticipation* in RI, because the negative effects of innovations are often unforeseen (Owen et al., 2013, p. 1570). Anticipation in RI is about asking 'what if' questions to consider contingency, what is known, what is likely, what is plausible, and what is possible regarding future impacts of innovations (Owen et al., 2013, p. 1570). In other words, there is a need to foresee to the best extent possible what effects of an innovation will be in the future, to then be able to steer them

in the right direction. Anticipation is implemented by using techniques such as foresight, technology assessment, horizon scanning or scenario planning (Owen et al., p. 1571).

Reflexivity in RI means "holding a mirror up to one's own activities, commitments and assumptions" (Owen et al., 2013, p. 1571). In other words, the innovators must be self-reflective about what they do and why, so that they can steer the innovation process in the right direction. In practice, this comes down to implementing "mechanisms such as codes of conduct", an "adoption of standards", and using "conversation as a tool" (Owen et al., p. 1571).

Inclusion means adding "new voices in the governance of science and innovation as part of a search for legitimacy" (Owen et al., p. 1571). For an innovation to be legitimate, it is important that every stakeholder is included in the process, so the innovation can be as democratically legitimate as possible. In practice, this comes down to "hybrid mechanisms that attempt to diversify the inputs to and delivery of governance" (Owen et al., p. 1571).

Finally, responsiveness is defined as "the capacity to change shape or direction in response to stakeholder and public values and changing circumstances" (Owen et al., p. 1572). In other words, the capacity to change course when necessary. If the innovation process is not going in the right direction, there must be possibilities for change. This can be ensured by standards and regulations (Owen et al., p. 1573).

To conclude, RI is the process of steering innovations in a responsible direction. Its starting premise is that innovations are the solutions to most modern-day problems, but innovations can lead to irresponsible effects too. Therefore, there is an aim for move beyond a techno-economic understanding of innovation. Moreover, RI aims to make innovations ethically acceptable, sustainable, and socially desirable. These aims are anchored in the values of the European Union. To achieve its aims, RI literature focuses mainly on the dimension of RI, which are anticipation, reflexivity, inclusion, and responsiveness.

It is surprising that the RI literature pays little to no attention to defining what innovation means, as has for instance been noted by Robert Frodeman in a review of the last RI handbook (2019). As I explained in the section above, conceptualizations of RI focus on the meaning of responsibility, but not on the meaning of innovation. By not establishing what innovation means in the first place, RI has a blind spot at its fundament. How can we steer innovations in a responsible direction, if we do not explicitly know what we mean by innovations?

Luckily, I am not the first one to ask this question. Recently, Lucien von Schomberg has rephrased this question in what he calls the 'conceptual challenge of RI'. I will now sketch this challenge in more detail, by closely reviewing a definition of RI and subsequently identifying the conceptual challenge that it raises.

The Conceptual Challenge of Responsible Innovation

Recently, Lucien von Schomberg published a book chapter on three challenges that face RI (2021). He calls these the epistemic challenge, the political challenge, and the conceptual challenge (Von Schomberg, 2021, p. 135). For this thesis, the conceptual challenge is the most relevant, since it highlights the problem of the conceptual unclarity of innovation in RI. I will still go shortly go over the other two challenges as well, because they are intertwined and cannot be discussed in isolation. Still, I will pay the most attention to the conceptual challenge.

If we take the definition from R. von Schomberg 2013, an *epistemic challenge* arises. L. von Schomberg notices that the decisions that are made throughout the innovation process require knowledge of values, criteria and outcomes (2021, p. 138). Especially the last one is relevant. If we want the outcome of innovations to be desirable, we must (to some extent) know what outcome we can expect based on the decisions that are made during the innovation process. However, a central characteristic of innovation is that its outcomes cannot be known (Rammert, 1997, as cited by von Schomberg, 2021, p. 138), because there is a fundamental and inherent uncertainty about the consequences of innovations (Blok & Lemmens, 2015, p. 28). L. von Schomberg argues that this need for knowledge for outcomes on the one hand, and the fundamental uncertainty of outcomes on the other, lead to an epistemic challenge for RI (2021, p. 139). That is: how can we steer innovation in the 'right' direction, if there will always be unexpected and therefore unknown consequences of innovations?

The *political challenge* of RI follows from the epistemic challenge. We have just established that knowledge is needed about the values, criteria, and outcomes of the innovation process. So, there is a need to decide on the content of these values, criteria and outcomes. What is deemed valuable? What is seen as a desirable outcome? Should there be consensus among stakeholders, and how should this be achieved? These are political questions (von Schomberg, 2021, p. 141). Even though the aims of RI are embedded into values of the European Union, it is still unclear how to interpret and weigh these values. Moreover, the inclusion of stakeholders is central to RI, but how to evaluate and weigh the difference in perspectives, is not clear (von Schomberg, 2021, p. 141). In other words, RI is in need of political decisions, both about its aim and its procedure.

This naturally leads us to the *conceptual challenge*, since it becomes clear that RI lacks conceptual clarity on these political issues (von Schomberg, 2021, p. 143). The conceptual unclarity lies mainly in the meaning of innovation. In visions, frameworks and policies of RI, most attention is given to steering the innovation process in a responsible manner and direction (Von Schomberg, 2021, p. 144). However, little thought goes to what innovation itself means conceptually (Von Schomberg & Blok, 2021). As I noted before, this is problematic, because the notion of innovation is so central to the mission of governments, companies, universities, etc. What also becomes clear is that the conceptual challenge of RI is politically laden and epistemically relevant. How we choose to conceptualize innovation is a *political* choice which will also affect the *epistemic* grounds on which our decisions regarding responsible innovation are made.

A question that rises now, is: how is innovation currently conceptualized in RI discourse? As we have seen, this is not done in an explicit manner. However, that does not mean that there is no current conception. There is an implicit concept of innovation in RI, that can be revealed by studying how it is used in context. In the next section, I will reveal that innovation in RI is still understood in techno-economic terms.

Exploring the Current Conception of Innovation

What does it mean to innovate? Innovation is one of these buzzwords that is simultaneously a key concept in our society and yet it is hard to pinpoint what it exactly means. The Cambridge Dictionary defines it as "(the use of) a new idea or method" (Cambridge University Press, n.d.). I will now articulate more clearly how innovation is conceptualized in RI, first by going over a constitutive text in RI-discourse and then situating my findings in the recent literature.

Allow me to go back to the earlier provided definition of RI, as was provided by R. von Schomberg in 2013.[6] In his paper '*A vision of responsible research and innovation'*, he defines the vision behind the framework of RI, so that it can be implemented by the EU (2013, p. 1). This was the first article to attempt such a defined vision and can be seen as the birthplace of the current concept of innovation in RI. Since Von Schomberg is a member of the European Commission, this article has become constitutive in defining RI at a policy-level. Moreover, with over 1700 citations and rarely left out of any paper about RI, this work is academically constitutive as well. It is safe to say that this text has had a fundamental impact on the meaning of innovation in RI. So, it is fruitful delve into the use of the concept of innovation in this article and see what is implicitly meant by innovation. To recap, this is the definition I am analyzing:

> Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society). (Von Schomberg, 2013, p. 19).

What becomes clear from this definition? First of all, innovation is a process and a product. Von Schomberg uses the word innovation to refer to concrete products, for example: "modern innovations are distributed through market mechanisms (...)" (p. 4). At the same time, he uses innovation to refer to the process of creating these products. For example: "competitors can improve their products through innovation" (p. 5). This is apparent in the definition of RI as well: the innovation process and *its* products (innovations) must be guided responsibly (von Schomberg, 2013, p. 19). Von

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[6] This section is loosely based on a paper I wrote as my final assignment for the class *Anticipation and Evaluation of Emerging Technologies*. To avoid self-plagiarism, I add this paper in the reference list as Van Balen, 2021.

Schomberg goes into these two sides of innovation explicitly as well. On page 21, he distinguishes between the product dimension and the process dimension of innovation. Both need to be guided 'responsibly' (Von Schomberg, 2013, p. 21).

So, innovation is a product and a process. But what kind of products or processes? In the introduction, von Schomberg contrasts modern innovations with 'mere' technical inventions (2013, p. 2). He reasons here that the difference between modern innovations and mere technical inventions is that modern innovations are distributed through the market, whereas mere technical inventions are not (Von Schomberg, 2013, p. 3-4). Here we see two aspects of the concept of innovation. It is technological and marketable. It is technological because in distinguishing it from technical inventions, the genus is that both are technological. The differentia is that innovations are marketable, and technical inventions are not. In other words, an innovation is a technological product or technological process that are distributed through market mechanisms. Innovations are commercial technologies, or the process of creating commercial technologies.

Indeed, further on in the text the word innovation and technology coincide or are used interchangeably (p. 5; p. 7; p. 13), and methods of RI are all related to technologies (technology assessment, value sensitive design) (Von Schomberg, 2013, p. 22; p. 27). There is also a clear economic component in the concept of innovation. Innovations are distributed through market mechanisms (p. 4), privatized in their production (p. 4), decided by market mechanisms (p. 5), and are moreover means for economic growth (p. 6). In other words, innovations are dictated by the market and therefore must lead to economic progress.

All in all, we see the following concept of innovation emerging. Innovation is a *process* that leads to *technological products* (that we call innovations) that come into existence dependent on the success they have on the market, and must lead to *economic progress*.

Innovation in a Techno-economic Paradigm

One may object that this is merely one text, and that it is unfair to extrapolate the meaning of innovation from it. However, this text is constitutive in the literature and lies at the basis of the common understanding of RI. Moreover, my argument does not exist in a vacuum. Recently, more work has been published on the nature of the concept of innovation (Blok & Lemmens, 2015; von Schomberg, 2021; Blok, 2021; Blok & Von Schomberg, 2021). I will now proceed to situate my argument in this literature. Doing this will strengthen its conclusion and moreover allows me to draw a larger conclusion about the implicit meaning of the concept of innovation in RI. I will conclude that innovation operates in a techno-economic paradigm.

In his recent article '*What is Innovation*', Vincent Blok tries to trace where the current meaning of innovation comes from (2021). He argues that the contemporary meaning of innovation is the commercialization of technological inventions (Blok, 2021, p. 2). For example, innovation scholar

Edward Phelps describes that innovation succeeds when 'flow supply' of ideas meet 'flow demand' of financiers (Phelps, 2009, p. 49). This means that an innovation has to be marketable to succeed. An idea on its own is not yet an innovation, there must be money for it. The OECD and European Commission came up with the following definition of innovation in 2005: [innovation is] "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations." (OECD, 2005). Here, again, we see that innovation is a product or a process. Moreover, there is an emphasis on the market (business practices, marketing methods).

Blok concludes in his paper that the contemporary self-evident understanding of innovation has the following tropes: newness, technological, serving economic progress, caused by a single human actor and good in itself (Blok, 2021, p. 9). This is similar to my conclusion, besides that Blok adds *newness*, the *human actor as subject* of innovation, and *good in itself*. In 2015, Blok and Lemmens came to a similar conclusion, namely that innovation in RI is self-evidently seen as technological and perceived from an economic perspective (p. 31). Blok and L. von Schomberg have also added to this debate by establishing that the four dimensions of RI (anticipation, reflexivity, anticipation, inclusion and deliberation) originate from debates about NESTs, and have always concerned technologies (von Schomberg & Blok, 2021, p. 4671). Moreover, they describe how innovation is nowadays characterized by its competitive dynamics (Von Schomberg & Blok, 2021, p. 4671).

My argument, combined with the previous literature, point to the suspicion that innovation is still understood in a techno-economic way. L. von Schomberg has already noted that innovation is presupposed in a technological *mode* (2021, p. 317). I argue that innovation operates in a techno-economic paradigm. I choose the term paradigm because it encapsulates three things: it is a worldview, a form of life and that it is hard if not impossible to reflect upon from the inside.

Sergio Sismondo describes a paradigm as follows: [a paradigm consists of] "beliefs about which theories are right, an understanding of the important problems of the field, and methods for solving those problems" (Sismondo, 2010, p. 13). The term originates from philosophy of science, specifically from Thomas Kuhn, but is applicable to the way that modern-day socioeconomic problems are viewed and solved too. A paradigm has two sides. First of all, is has a theoretical side. It is a worldview, that provides categories and frameworks into which phenomena are slotted (Sismondo, 2010, p. 14). Secondly, it has a practical side. A paradigm is also a form of life, that provides patterns of behavior or frameworks for action (Sismondo, 2010, p. 14).

This can be applied to the contemporary meaning of innovation in RI. The central belief is that innovations are the solutions to modern-day problems (OECD, 2010). Due to the fact that innovations are seen as the 'right' way to go, the problems of our current society are conceptualized in a technological manner. If there is a problem, there must be a technological solution for it. Here we see that the theoretical side of innovation (defining it as a technology that must bring economic progress) determines how we categorize problems and how we methodically choose to solve them.

Paradigms do not only provide a theoretical foundation for the way that problems are conceptualized and solved, but they have a practical side too. They provide patterns of behavior and actions and can be seen as communities that maintain themselves by continuously reaffirming the paradigm through their actions. To make this more concrete, I argue that RI is also a paradigm in this social sense. There is an interplay between scientists, philosophers, institutions, politicians, engineers, etc. that by their actions keep the paradigm going. When an innovation needs to become responsible, there are certain predetermined actions (the evaluative methods) that are set in motion by the paradigm.

When a worldview and the accompanying actions become so habitual, it becomes harder (if not impossible) to reflect on them. This is why we lose sight of assumptions that lie at the basis of a paradigm. This could be one of the reasons that innovation operates in a techno-economic paradigm, even though there is an aim to move away from it. Still, the question remains why innovation operates in such a paradigm, even though there is a clear aim in RI to move beyond a techno-economic concept of innovation.

Conclusion

In this chapter I asked a) what the conceptual challenge of RI is, and b) what concept of innovation is currently implied in RI. To answer this question, I started with a short description of RI, in which I specifically highlighted its aims and defining characteristics. The aim of RI is to steer innovations in a responsible direction, which is defined by ethical acceptability, sustainability, and social desirability. The second aim is to move away from a techno-economic conception of innovation, because this has been the cause of unethical, unsustainable, and socially undesirable effects. By making the innovation process anticipatory, reflexive, inclusive, and responsive, RI aims to steer the innovation process in a responsible direction.

In the literature there is a focus on the *responsible* side of RI, that concerns either the aims or the means of RI. However, there is a gap in the literature when it comes to the *innovation* side of RI. In policy documents and academic literature, the concept is either not defined or defined vaguely. This led me to the conceptual challenge of RI, which states that there should be more clarity about the concept of innovation in RI. This challenge is not merely conceptual, because explicating the meaning of innovation is also a political matter. Innovation is seen as the solution to most contemporary problems, so its meaning has political consequences.

After establishing the conceptual challenge, I proceeded to analyze the concept of innovation in the text '*A vision of responsible innovation*' from René von Schomberg (2013). This analysis showed that innovation is understood as a *process* that leads to *technological products* (that we call innovations) that come into existence dependent on the success they have on the market, that and must lead to *economic progress*. After situating this argument in recent literature, I concluded that innovation in RI operates in a techno-economic paradigm. Since one of the aims of RI is to move away from a techno-

economic concept of innovation, this paradigm is problematic. There is conceptual ambiguity between the ideal of RI and the practical use of the concept of innovation in RI.

L. von Schomberg has done well to observe the conceptual challenge and bring it to light. However, his analysis is not thorough enough. He points to a problem, but he does not explain it. If we want to solve the conceptual challenge of RI, it is important to understand where it comes from in the first place. Von Schomberg's work is a promising starting point for this, but the lack of explanation also makes it hard to think about possible solutions.

The necessity for a thorough explanation of the conceptual challenge is strengthened by the fact that it is apparently difficult to move away from a techno-economic concept of innovation. What I have shown above is that innovation implicitly still operates in a techno-economic paradigm. This suggests that the conceptual challenge does not only entail that RI does not take an explicit stance on the concept of innovation, as Von Schomberg argues. It shows that the challenge leaves RI with a techno-economic concept of innovation, even though there is an aim to move away from such a concept.

So, there is a need to understand why innovation is facing a conceptual challenge and why innovation is operating in a techno-economic paradigm. Moreover, there is a need to map out the consequences of the conceptual challenge in more detail. This is necessary because we can only start to think about possible solutions once the challenge is properly understood. We must know why it is difficult to conceptualize innovation in a different manner, and if it even is possible to conceptualize innovation in a different manner. This is the task that I bestow on myself in this thesis.

However, I will not research the techno-economic paradigm fully. I will rather limit myself to researching the technological conceptualization of innovation. I do this because researching both the technological and the economic component of innovation would be too extensive for a single thesis. Examining where the economic paradigm of innovation comes from would quickly turn to an answer such as 'capitalism', and this would not be too much of an insight.

This is why I will concern myself with the question about the technological paradigm of innovation. Why has it happened that RI can only understand innovation in technological terms? The question about the technological mode of living has become less popular to ask over the last decades in philosophy of technology, since there is more concern about concrete artifacts than 'the' question concerning technology. However, the conceptual challenge of RI and the implicit technological understanding of innovation does make this question relevant again. Therefore, I will now turn to a philosopher that was concerned with understanding and mapping how and why it is the case that modern humans conceptualize the world in a technical manner. This is what Jacques Ellul argued for in his book *The Technological Society* (1964).

Chapter 2: Jacques Ellul and the Technological Society

In chapter 1, I introduced the framework of Responsible Innovation, focusing on the notion of innovation. I showed that the concept of innovation lacks clarity in RI. This is problematic, because conceptualizing innovation has epistemic and moreover political consequences for how innovations are evaluated in RI. I then showed that the implicit meaning of innovation in RI operates in a techno-economic paradigm. This is at odds with one of the aims of RI, namely, to move beyond a concept of innovation that is dictated by techno-economic incentives. This raises the question why it has happened that innovation operates in a techno-economic paradigm. I am specifically going to research why RI is understood in purely technological terms. To answer this question, I will turn to the philosophy of Jacques Ellul. In this chapter, I will give an introduction to his thought and a justification for turning to his philosophy for finding an answer to my research question. The question I will be answering this chapter, is "How can Ellul's Technological Society be interpreted to understand the conceptual challenge of RI?" I argue that Ellul can be read as a phenomenology of the technical state of mind of modern humans, and that his philosophy can help to explain why we have a hard time to conceptualize the world in a non-technical manner.

Introduction

Jacques Ellul (1912 – 1994) was a French sociologist, who researched technology as a sociological phenomenon, and studied the relation between humans, society, and technology. Next to that, he was a devoted Christian and published works on theology. His work on technology has been proven relevant for the philosophy of technology as well, although his philosophy has gone out of fashion lately. Ellul was concerned about technology as an abstract societal phenomenon ('Technology with a capital t') rather than technologies as artifacts. Since the empirical turn in philosophy of technology, it has become less fashionable to study 'Technology', because it is deemed to abstract and generalizing.

However, for this project, it is relevant to study technology with a capital T. As established in the previous chapter, there is a desire in RI to steer concrete technological artifacts (innovations) in a responsible direction. To do this, there is a call to move away from a technological concept of innovation. However, even though this wish exists, innovation still operates in a techno-economic paradigm. This gives rise to the suspicion that there is an inability to move away from technological thinking. To properly come to an understanding of this inability, it is important to turn to technology as an abstract societal phenomenon once more.

The red threat that runs through Ellul's work is that the relation between humans, society, and the environment have become 'technical' to the core. I will later on explain in detail what he means

with this. For now, I want to highlight this red threat because it is the reason that I turn to his philosophy to find an explanation for the conceptual challenge of RI. Ellul has argued at length that our society is dominated by a technological way of perceiving the world. In a sense, he has described how we are operating in a technological paradigm, and why we cannot move away from it. For this reason, I will use his philosophy to understand the conceptual challenge of RI.

In this chapter, I will work through Ellul's argument that 'technique' is the prime characteristic and determining factor of Western society. I will start by shortly situating Ellul since that will make it easier to interpret his writings. Then, I will explain his argument about technique, by discussing his main work, *The Technological Society* (Ellul, 1964). Then, I will reflect on relevant consequences of his argument. Finally, I will respond to the essentialism and determinism that Ellul can be accused of. In this way, I will end by bringing forth my own interpretation of Ellul, which I will use to study the conceptual challenge of RI in chapter three.

Situating Ellul

To properly understand Ellul's thinking, I want to situate his work a little before going into it. A first important factor to realize when interpreting Ellul it that he is a sociologist. This has two relevant consequences for how he would like to be interpreted, as he tells us in the foreword of *The Technological Society*. Firstly, his work is descriptive (Ellul, 1964, p. 36). He himself makes clear to his readers that his ideas are no theoretical constructs. Rather, they are sociological interpretations of factional observations (Ellul, 1964, p. 36). This means that his work is at heart not normative, according to Ellul himself. Although Ellul is often accused of being a pessimist, he sees himself merely as a bringer of descriptive facts. As a sociologist, he is trying to find the truth about our 'collective sociological reality' (Ellul, 1964, p. 38).

The second reason why it is important that Ellul is a sociologist, is that he sees humans as beings that have always been determined by sociological factors. Primitive humans were determined by prohibitions, taboos, and rites. Modern humans are determined by technique (Ellul, 1964, p. 39). So, when Ellul argues that the modern human is determined by technique, he does not say that modern humans are unfree relative to the freedom that primitive humans enjoyed. Primitive humans were also unfree but conditioned by different sociological phenomena than modern humans. This is important because it takes away the itch we may get from reading that humans are determined by technique. When Ellul writes this, he means that technique is nowadays the main sociological factor that makes up how humans live and live together. He does not mean that we were once in a romantic blissful free state without technique, and that we are now chained to it. So, since Ellul is a sociologist, he at least claims

to be descriptive, and he views humans as determined by social phenomena.[7] With these lenses, he comes to the conclusion that the contemporary human is determined by technique. With these caveats in mind, we can start to grasp what he means by this.

A second important factor that situates Ellul's work is that he was influenced by Karl Marx, whom he admired. Ellul even said that Marx' analysis of the relationship between humans and money was "perfectly correct" (Ellul, 1976, p. 38). Ellul is, like Marx, a historical materialist. Historical materialists reject the Hegelian idea that history is determined by ideas and that historical trends can be found in the mind. Historical materialists believe that historical trends are situated in materiality, i.e. in the empirical world. So, if we want to know trends throughout history, we must look at practices, technologies, means of production, etc. This means that Ellul's ideas about technique must be seen as an empirical reality rather than an abstract idea. So, now that I have situated Ellul as a descriptive sociologist that aims to find trends in society by studying the material world, it is time to delve into his argument about technique.

Technique

In 1964, Ellul's most important work, *La Technique ou l'enjeu du siècle* (1954) was translated into English, as *The Technological Society*. In it, Ellul argues that 'technique' has become the prime determining factor in the relation between humans, society, and the environment. I will show that he means by this that the technical pursuit of rationally finding the most efficient method to control and predict things has nested itself deeply in how humans conceptualize their relation to the world, each other, and even themselves. The driving force (determinant) of this way of thinking is the phenomenon of 'modern technique', that Ellul opposes from traditional technique.

I will start by explaining what Ellul means by technique. Even though it is translated into English as 'technology', it means something different. In a note to the reader before the book starts, Ellul defines technique:

> As I use it, the term technique does not mean machines, technology, or this or that procedure for attaining an end. In our technological society, *technique* is the *totality of methods rationally arrived at and having absolute efficiency* (for a given stage of development) in *every* field of human activity. Its characteristics are new; the technique of the present has no common measure with that of the past. (Ellul, 1964, p. 35).

I will now go through this definition step by step, because there is a lot to unpack, and along the way it will become clear what Ellul means with technique. Intuitively, technique simply means a way to do something (writing-technique, hunting-technique, etc.). Take for example the definition from

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[7] I aim to interpret Ellul in a charitable way, so I am reading his work as descriptive and his use of the word 'deterministic' in a sociological way. At the end of this chapter, I will shortly reflect on the pessimism and determinism that he is accused of.

Cambridge University press: "a way of doing an activity that needs skill" (Cambridge University Press, 2022). Often, techniques are technologies, for technologies can be a new way of doing something (the printing press was a new technique to copy pages). However, techniques and technologies are not the same thing. This is a good starting point for interpreting Ellul's definition, because the first thing that we read is that technique is not the same as machines, technology, or a procedure.

Ellul spends a small chapter in *The Technological Society* on this distinction between a machine and technique. The distinction is important because we tend to think of techniques as concrete machines or artifacts. This is not surprising to Ellul, because a machine is indeed a technique (Ellul, 1964, p. 51). However, even though a machine is *a* technique, technique as Ellul means it is more than just a single machine. Technique is broader and more abstract than any concrete artifact or procedure. Moreover, according to Ellul, confusing machines with technique is dangerous, because then we are overlooking all the other areas outside the industrial context where technique has an influence (Ellul, 1964, p. 51).

Even though technique and machines are not the same thing, they do share a relationship, according to Ellul. The machine is the embodiment of the ideal that technique strives towards (Ellul, 1964, p. 52). Machines are 'pure technique', according to Ellul (Ellul, 1964, p. 52). So, a machine is a technique, and the perfect machine would be the ideal of technique. Let me focus on an example to make this clearer.

Machines are essentially means that allow us to reach some end in a rational and efficient manner. For example, a washing machine provides us with an efficient and rational way to achieve the goal of having clean clothes. By following the same rational ordered steps (put in clothes, lotion, turn on the right program, wait x amount of time, etc.). I can control how my clothes are cleaned, for how long, at what temperature, etc. At the same time, I can wash a lot of clothes at the same time, and I do not have to put in effort to warm up the water or move the clothes around myself, thereby making it an efficient way of washing clothes. The washing machine is thereby 'a technique' to wash clothes. Technique as Ellul means it refers then to the machine-like ideal of rationality, efficiency, predictability, and control. The relation between a machine and technique is one of idealization. The perfect machine would be the ideal of technique.

A final thing that is relevant to note about Ellul's ideas about the relation between machines and technique is that he thinks that the machine and thus technique are inhumane (Ellul, 1964, p. 53). Qualities such as rationality, efficiency, control, and predictability are no human qualities according to Ellul. Humans are irrational, playful, free, and unpredictable (Ellul, 1964, p. 54). There is for Ellul thus a contradiction and tension between human nature and technique. Human nature, or human freedom, is also what is at stake for him. In a world that is determined by technique, humans lose their freedom, and capacities for things such as spontaneity and irrationality.

Because, in a world that is determined by technique, humans are conditioned by it and must adapt to it. I write must because, according to Ellul, it is a matter of having to rather than wanting to. Since human nature and machines are opposites, and technique has become the determining factor in

our society, humans are the ones that have to change. This makes humans more like machines. According to Ellul, it is no longer sufficient to speak of 'man' and 'machine' as two separate phenomena, but we must acknowledge that humans have become machine-like (Ellul, 1964, p. 56).

So, technique does not mean the same as a machine, but it shares certain relationship with the machine. First of all, a machine is a technique, in the sense that it is a rational instrument to reach some end in an efficient manner. However, technique is much more than a machine. Secondly, the machine is the ideal of technique, the perfect machine is what technique strives towards. Machine-qualities such as order, rationality, predictability and control are part of this ideal. Thirdly, technique, like the machine, is opposed to human nature. And in a world that is determined by technique, humans will become machine-like, too.

Moving on to the second part of Ellul's definition of technique, he writes that technique is "*the totality of methods* rationally arrived at that aim at absolute efficiency" (Ellul, 1964, p. 35, own emphasis). Ellul writes 'the totality of methods' to emphasize that he is talking about a sociological phenomenon rather than a single method or technology. Ellul was a historical materialist, so he identified the social determinant 'technique' in materiality. This is why technique must be seen as the material, sociological force that the combination of all the rational methods that aim for efficiency make up together. This force determines the relationship between humans, society, and the world. I thereby side with Robert Merton's interpretation of Ellul, who wrote the foreword to the English translation of *The Technological Society*, who interpreted technique as "any complex of standardized means for attaining a predetermined result" (Merton, 1964, p. 10).

Ellul claims in his definition of technique also that the methods have 'absolute efficiency'. Efficiency plays a central role in his work. He writes that technical activity is characterized by "the search for greater efficiency" (Ellul, 1964, p. 80); efficiency is the end of technique (Ellul, 1964, p. 82); and the sole reason for choosing amongst means (Ellul, 1964, p. 82). However, what he exactly means by efficiency is contested to this day, especially because Ellul does not define it clearly (Son, 2013, p. 49).

Some hints to what Ellul means with efficiency are that he describes aiming for efficiency as "a complex of acts to improve the yield" (Ellul, 1964, p. 32), and choosing the most efficient means as "the best adapted to the desired end" (Ellul, 1964, p. 82). So, efficiency is then basically about optimizing the process between input and output. Ideally, this efficiency is absolute, meaning that we base our judgement of the most efficient method on objective evidence, such as calculations and experiments (Ellul, 1964, p. 84).

However, this is still a vague definition, because efficiency is then context-dependent (and thereby not absolute), as has been noted by Son (2013, p. 51). Efficiency is always the efficiency of something, and with this definition it could mean something entirely different depending on the field that it is applied in. For example, efficiency in healthcare is something different than efficiency in

manufacturing, because these fields have different goals and different means. This is problematic, because then efficiency cannot be the 'absolute' basis of judgement between different methods.

However, I am sympathetic towards the interpretation of Son, who argues that Ellul does not mean efficiency in a literal, quantifiable manner. Rather, Ellul means that everything is done *in the name of* efficiency (Son, 2013, p. 53). We choose one method over the other because it is *deemed* more efficient. If it actually is, and what this efficiency actually means, does not matter. The point is that the justification for choosing one technique over the other is done in the name of efficiency. Through this interpretation, Ellul's vagueness in defining efficiency makes sense, because it is precisely the point that we are justifying our choices through an arbitrary machine-like value such as efficiency.

Let me now give an example of how technique, as a social determinant, influences the relation between humans, society, and the world, to make more sense of the discussion of Ellul's argument. When I, an (at best) amateur runner, go for a run, I take my phone with me to track my speed so that an app can calculate how I can use my energy in 'the most efficient way'. At the same time, I do not really know or care what this efficiency means, but it satisfies me enough that I can choose the most efficient way of running. By tracking my speed, time, energy, etc. in a quantified way, I can turn the activity of running into something that I can calculate, control and predict. Basically, I can turn the activity of running into a technical activity. And, by doing so, I am taking away the spontaneity and openness out of it, because I already know beforehand where I am going to go, how fast I am going to run, when I will be back, etc. Thereby, I am not only turning running into a technical activity, but I am turning myself into a technical human as well. This way of mechanically conceptualizing the act of running and my desire to find the most efficient method to run, is caused by technique. I am perceiving the world, others, and myself through machine-like glasses, thereby rendering everything into a mechanical problem that is waiting for an efficient solution.

This is a personal example, but apps like Strava and wearables like FitBit are popular nowadays and its user-community has been analyzed extensively as the quantified self-movement (Lupton, 2016). The idea there is that people start to see themselves as a collection of datapoints that they can improve by tracking their health and 'improving' it by doing exercise and eating healthy. It has for example been noted before that users start pacing around their homes in order to reach the required amount of steps that they have to take in a day, thereby replacing the goal to become healthy for an aim to reach a certain quantified metric (Ruckenstein, 2017, p. 269). In other words, the concept of health becomes a metric. This is what Ellul means when he is arguing that humans start to perceive non-mechanical concepts are becoming mechanical.

Essentially, Ellul is saying that humans are in every area of life and society looking for the most efficient method, as if life and humans themselves are technical problems, waiting to be solved in an optimal, calculative way. Technique is then the sociological force that determines our psychology in this sense. All techniques (or rational methods that aim at efficiency) combined, so machines and mechanical ways of doing things, form a sociological phenomenon that turns the human condition and

human society into the ideal of a machine. It creates technical humans, who are obsessed with a quest for efficiency, optimization and control.

Ellul ends his definition with the statement that technique is present in every field of human activity, and that modern technique has no common measure with technique of the past. At this point, Ellul's claim that technique is present in *every* field of human activity seems rather strong. One can easily see how technique is present in fields such as production (standardizing and rationalizing production lines to create efficient mass production) or war (rationally and efficiently making use of soldiers and weapons). However, this is not such a revelatory insight, especially because it has always been the case that humans are looking for techniques in these areas (primitive men had hunting techniques). These insights do not make humans like machines yet, and they also do not prove that 'every' field of human activity is now determined by technique. To understand Ellul's stronger claim it is important to zoom in on the characteristics of modern technique, that make it different in degree and kind than traditional technique.

Modern Technique and Traditional Technique

Ellul argues that the relationship between technique, society and the individual was the same in all civilizations, until the eighteenth century (Ellul, 1964, p. 185). However, since then, technique has become a different phenomenon, that does not share any of the old characteristics. Because of an increase in quantity, modern technique has become a qualitatively different phenomenon than traditional technique (Ellul, 1964, p. 157). This difference does not come from the intrinsic characteristics of technique. Ellul writes that "the mental operation by means of which Archimedes constructed certain engines of war is identical with that of any modern engineer who improves a motor." (Ellul, 1964, p. 156). The main difference is that technique has become an object in itself (Ellul, 1964, p. 158).

Ellul means that technique is no longer just a tool, used by men to control their environment. It used to function as an intermediate between humans and their environment. But it has become an entity that stands on its own and does not only exist by virtue of men or the environment. According to Ellul, is independent and extends into all spheres of life. I will come back later to what this means in depth, but for now the previous suffices as Ellul's thesis on the difference between traditional technique and modern technique. It is important that Ellul sees the shift from traditional to modern technique in the *relation* between technique, humans, and society, and not in the internal characteristics of technique.

To understand this relational shift, where technique went from a tool used by humans to an independent object, it is important to first understand the relationship between technique(s), society, and humans that existed before modern technique. Ellul calls these preceding techniques, societies and humans 'traditional' so I will do the same (and excuse myself for romanticizing or essentializing

'traditional' societies or humans, Ellul's and my intention here is merely historical).[8] Ellul argues that the relationship between traditional techniques, humans, and society was limited compared to modern technique. He identifies four characteristics of these limitations.

First of all, in traditional societies, technique was only applied in limited areas such as production, hunting, war, or consumption (Ellul, 1964, p. 160). In other areas, such as religion, spirituality, or the law, technique was not applied. Ellul argues that there was room for spontaneity instead (Ellul, 1964, p. 161). For example, there was room for human intuition in the law, rather than predetermined standardized procedures that bans 'human error' as much as possible from the judgement.

Secondly, the time that people spent on the use of techniques was short in traditional societies compared to modern society (Ellul, 1964, p. 163). People spent more time on other activities, such as conversation, sleeping, or meditation (the best, according to Ellul) (Ellul, 1964, p. 163.). For Ellul, the limited areas of application and time spent on technique shows that technique was not as important as it is in modern society. Its status was different. In traditional society, technique was an instrument. In modern society, it is seen as the bringer of progress.

Thirdly, technique in traditional technique was local, so there was a spatial limitation (Ellul, 1964, p. 168). Ellul means that civilizations had their own techniques, and that techniques did not necessarily cross over or spread from civilization to civilization. In other words, technique was limited to operate only in local contexts. This made technique "subjective in relation to its own culture" (Ellul, 1964, p. 170), too. Therefore, it did not yet have the independence and objectivity that modern technique characterizes.

The fourth and final characteristic of the relation between traditional society, technique, and humans is that there used to be a possibility of choice for human beings (Ellul, 1964, p. 181). Because traditional techniques were limited in their area of application, their status, and their geographical application, techniques were different dependent on culture and place. For Ellul, this means that there is always a human choice between different techniques, and a human choice to escape techniques altogether. In other words, if I don't like technique X in society Y, I can always choose to not use technique X by going to another society, or by escaping society altogether.

Concluding, three characteristics that made up the relation between traditional technique, traditional society, and traditional humans, are that technique was applied in limited areas, with a limited status, and a limited geographical scope. This led to the fourth characteristic, which is that there was human choice involved in the relation between technique, society, and humans.

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[8] To be clear, traditional societies are then all societies before the eighteenth century. Modern society is society after the eighteenth century, but Ellul is mainly writing about his own time, so the 1950's in France. When I write *our* society, I mean contemporary society, so Western-Europe in 2022.

Characteristics of Modern Technique

Modern technique does not share any of the previous established characteristics, according to Ellul (Ellul, 1964, p. 186). His main claim is that technique is no longer limited. It is now applied in all areas of life, it has the highest status, and it has no geographical limitations since it "covers the whole earth" (Ellul, 1964, p. 186).

Modern technique is, as I said before, a consequence of a change in quantity of techniques. During the eighteenth century there was not only a rise in the use of concrete machines (commonly known as the Industrial Revolution), but also a rise in the application of techniques. Ellul gives the example of how law changed in France under Napoleon. The spontaneous sources of law, such as custom, were abandoned, and instead the law was systemized (in Napoleon codes), unified (under the state), and clarified (in policy documents) across the whole of France (Ellul, 1964, p. 123). The same pattern of systemization, unification, and clarification happened with planning of roads, the organization of the police, and even the infrastructure of the state (Ellul, 1964, pp. 122-124). Ellul goes so far to say that even in intellectual circles, technique became more prominent. The analytic philosophy and principles of René Descartes are an example of this (his technical method but also for example his analogy between the machine and the human). Ellul describes this movement in the eighteenth century as follows, providing us with another interpretation of technique:

> (…) it might be said that technique is the translation into action of man's concern to master things by means of reason, to account for what is subconscious, make quantitative what is qualitative, make clear and precise the outlines of nature, take hold of chaos and put order into it. (Ellul, 1964, p. 124).

Here, Ellul shows how technique is about the general will to control 'everything' that is qualitative, chaotic, and unpredictable. We use reason, logic, and quantitative methods to control these things. This is true today when we look for example at smartwatches that track our heartrate, calories burnt, steps taken, minutes meditated, time slept, etc. to give us a quantitative analysis of how we are doing. This is turning something qualitative like wellbeing into a quantitative phenomenon that we can control with reason.

To be more concrete, Ellul provides us with seven characteristics that are typical of modern technique. These are rationality, artificiality, technical automatism, self-augmentation, monism, necessity, universalism, and autonomy (Ellul, 1964, p. 187). The first two are so obvious to Ellul that he does not care to go over them extensively. By rationality, he means that the spontaneous or irrational is replaced by systemization, standardization, clarification, predictability, etc. Essentially, rationality means that any method is reduced to its logical dimension (Ellul, 1964, p. 187). Artificiality means that technique is opposed to nature. It controls, dominates, and even eliminates the natural, thereby being

opposed to it (Ellul, 1964, p. 187). The other five characteristics are less obvious, and Ellul spends some more time explaining those.

The third one is technical automatism. By automatism, Ellul means that the technical system makes choices on its own, without the involvement of human choice (Ellul, 1964, p. 190). Say there are three techniques to choose from, to for example decide what the best way is to build a new road from A to B. Since technique operates on mathematics and rationality, there will be one route that is the most efficient. Ellul means by technical automatism that the solution that presents itself as the most efficient one is the only possible solution. In a sense, it is thereby not a choice, but an automatic process.

The fourth characteristic is self-augmentation. According to Ellul, technique expands on its own, "almost without decisive intervention by man" (Ellul, 1964, p. 200). This is because modern men are so enthusiastic about technique that they mistake human progress for technical progress (Ellul, 1964, p. 201). And secondly because the number of technicians and techniques is increasing at a rate that it becomes a given that techniques expand (Ellul, 1964, p. 202). The consequence of this self-augmentation is that technical progress becomes irreversible and that societies that we see as 'the most developed' are the ones that are furthest in technical progress.

The fifth characteristic is monism, meaning that all techniques together form a whole (Ellul, 1964, p. 217). By this, Ellul means that all techniques operate according to the same characteristics, or that they share the same essence. It is comparable to how Plato envisioned the difference between Ideas and appearances in *The Republic*, where what we see in the real world is merely a shadow of some perfect Ideal form (Plato, 1997). All techniques correspond in this sense to the ideal of the machine, and this ideal is technique.[9]

The sixth characteristic is universalism, which Ellul means in a geographic and qualitative manner. I went over the first already a little in the discussion about the transition from traditional to modern technique. Ellul argues that technique is now expanding without geographical limitations, so in this sense it is universal (Ellul, 1964, p. 259). It is also qualitatively universal, because technique is spreading to all areas of society, and thereby society itself is becoming technical, or machine-like.

Finally, there is the autonomy of technique. Ellul writes:

> Technique elicits and conditions social, political, and economic change. It is the prime mover of all the rest, in spite of any appearances to the contrary and in spite of human pride, which pretends that man's philosophical theories are still determining influences and man's political regimes decisive factors in technical evolution. External necessities no longer determine technique. Technique's own internal necessities are determinative. Technique has become a reality in itself, self-sufficient, with its special laws and its own determinations. (Ellul, 1964, p. 291).

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[9] Even though, to be clear again, Ellul means this in a material way rather than an idealistic way.

Here, Ellul comes to his point that technique has become an independent reality, that stands on itself, and does not 'need' humans anymore to exist. Ellul is saying that even though we might believe that we are in control of technique, technique is actually in control of itself. Usually, we think that our social or political decisions decide which techniques or technologies develop and in what direction. Only if we think that we need a technique in order to solve a problem, we decide to develop it. However, Ellul argues that, because technique has become a universal, self-augmenting, monist system that decides by its own rational logic what the best solution is, technique does not need human influence anymore to develop. In this sense, it is autonomous. It has the ability to expand according to its own internal logic.

I understand this autonomy as the power that technique has over the way that humans conceptualize the world, each other, and themselves. As I argued before, technique, understood as an empirical reality, has a sociologically determining effect on the relationship between humans, society, and the world. It has autonomy in the sense that technique determines how humans conceptualize the world in a technical way. Because technical thinking is embedded so deeply in human consciousness, it has power over human thought and action. In chapter three, I will provide a more concrete example of this.

The autonomy of technique also implies that technique has power, over morality. Ellul argues that "technique tolerates no judgement from without and accepts no limitation" (Ellul, 1964, p. 292). What he means by that is that the development of technique is guaranteed, and that moral judgement and interference with the development of technique can only come after its development. The most striking example of this phenomenon to me is the development of the atom bomb. The technical possibilities and its possible creation in other places (if we don't build it, they will) justified its creation. Thereby, the development of the atom bomb became a guarantee, sort of a given. The moral concerns about the atom bomb then focused on mitigating possible negative consequences of the atom bomb once it was already in existence. However, its existence was in a sense unstoppable and not susceptible to moral judgement. This is what Ellul means by the autonomy of technique.

Objections and Conclusion

Now that I have provided an extensive summary and interpretation of Ellul's main argument about technique, I want to go over two objections that have been provided against Ellul. These have been provided by Andrew Feenberg, and the objections focus on the apparent essentialism that is present in Ellul's philosophy. After explaining the objections, I will respond to them, thereby developing a more critical own account of Ellul. I argue that Feenberg is right to critique Ellul's philosophy for being useless for practical solutions to the problems that it raises. However, I disagree with the accusation of essentialism, because Ellul does not place technique outside of the human sphere. That is conflating technique with technology and lies in misunderstanding that technique is a psychological concept.

Moreover, Feenberg interprets Ellul's 'determinism' wrongly. Ellul himself has clearly stated that he is not a determinist, and I will side with him by interpreting the autonomy and determining power of technique as *a* determining power rather than the only one. I conclude that Ellul provides us with a fruitful argument for the machine-like manner that humans conceptualize the world and society in nowadays.

In his book *Questioning Technology* (1999), Andrew Feenberg makes an argument against the essentialism of Ellul. By essentialism, he means the view that technologies have an 'essence', an intrinsic nature that determine their character (Feenberg, 1999, p. 3). Essentialism also entails that technology is the main reason of problems in modern society (Feenberg, 1999, p. 3). Feenberg accuses Ellul of essentialism. According to him, Ellul argues that technique is the essence of technology and moreover the main cause of problems in modern civilization. Indeed, as I have shown above, Ellul argues that the machine-like ideal of rationality and efficiency is what characterizes modern technologies. Moreover, Ellul argues that this ideal of rationality and efficiency has entrenched into all areas of human life, to the point where it reduces humans to machines too.

Feenberg agrees with Ellul that the modern world is obsessed by a quest for efficiency (Feenberg, 1999, p. ix), but he disagrees that this efficiency is inherently located in technologies and that it determines all aspects of human life. According to Feenberg, the idea that efficiency or rationality is the essence that all technologies share is a mistake, because it places the ideology of efficiency and rationality outside of human control. For essentialists like Ellul, technology has become a phenomenon that is separate or independent from humans (Feenberg, 1999, p. ix).

Feenberg has two problems with this essentialism. First of all, there is a pragmatic objection against the determinism that it implies. The problem is that placing technology outside the realm of human influence makes it impossible for humans to change the detrimental effects of technology. Technology is an independent and unstoppable force for essentialists. So, essentialists can critique technology as an abstract phenomenon but are unable to come up with constructive solutions of how to change technology (Feenberg, 1999, p. ix). Changing technologies will not change their essence, so from the essentialist perspective, the solution can never be achieved from a technological perspective. This is pragmatically problematic, because contemporary society is technological to the extent that it seems impossible to reasonably expect a non-technological 'way out' of technology's essentialism. So, Feenberg is worried that it is impossible from Ellul's perspective to expect any reasonable way out of the misery.

Apart from this pragmatic concern, Feenberg has a more ontological problem with the idea of technology having an essence. That is, essentialism overlooks the different roles and meanings that technologies can take and have taken throughout history and contexts. Essentialists take the position that technology has one 'true nature', or one true meaning. However, Feenberg points out that there is a difference in the meaning that people attribute to technology, that is time- and context-dependent (Feenberg, 1999, p. x). He takes the constructivist position that the meaning of technology is

historically, culturally, and socially constructed. For example, a house can be an efficient technology to an engineer, but it can mean something different (that is not reducible to an efficient means-ends relationship) for the people living in it (Feenberg, 1999, p. xi). For them, a house can be a place of warmth, family, relaxation, etc. In other words, the users of technology may not be as concerned with efficiency as the designers. This indeterminacy between ideology and experience is evidence for Feenberg that essentializing technologies is not right. There may be an ideology of efficiency, and it may even be present in the design of technologies, but it is not the true nature of technology to 'dictate' efficiency.

Rather, the ideology of efficiency is located in the technocratic elite (Feenberg, 1999, p. 101). The problem with modern technologies is more than anything that their role in social and political life has been overlooked in democratic decision making. A technocratic elite is in control of technologies, and they do abide by an ideology of efficiency and rationality. By locating the root of the ideology of efficiency in the technocratic elite, Feenberg offers the way out that Ellul could not. The ideology of efficiency can be changed if other people than the technocratic elite are included in the design process of new technologies (Feenberg, 1999, p. xv). In other words, the ideology can be changed if technological decision making opens up to a broader public, i.e., by making it democratic. Once the users' perspective is included into the design of technologies, it is possible to move away from the ideology of efficiency and democratize technology-design. In this sense, Feenberg wants to offer a non-essentialist, non-deterministic way out of essentialist philosophies like Ellul's[10].

Feenberg's argument against essentialism and for democratization goes against Ellul's thesis in two ways. First of all, Feenberg is critical at Ellul's determinism from a pragmatic standpoint, namely that Ellul does not seem to leave room for a reasonable solution for the problems that modern technologies cause. Secondly, he disagrees with Ellul's argument that technique is the independent essence of technologies, because technologies take on different meanings depending on cultural, social, and historical contexts.

What stance to take in face of these objections? First of all, Feenberg's pragmatic objection suggests that Ellul is unable to provide any reasonable solutions from the dangers that he diagnoses. That is, changing technology will not change the dangers of technology, because the essence of rationality and efficiency remain the same. Ellul actually goes into possible solutions for 'escaping' the consequences of the determining power of technique. He lists three ways out; 1) a destructive war that destroys technique, 2) enough awareness of the threat to human freedom so people revolt, 3) a divine intervention (Ellul, 1964, p. xxx). The first and third way out seem more like utopian dreams than a probable reality, so Feenberg is right there. The second option is somewhat more likely, and the aim of Ellul's work is also to raise awareness of the threats that technique pose to human freedom. However,

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[10] I do not have the space to go over Feenberg's argument on democratization of technology-design and development completely, and it is at this point not relevant enough for my project.

at the same time, Ellul sees little room for human awareness about this threat, because human awareness is becoming more and more occupied by technical thinking. In this sense, Feenberg is right, and it is not useful to turn to Ellul's philosophy to find solutions for the problems that he raises.

Feenberg's second objection, where he accuses Ellul of essentialism, seems valid at first glance. Ellul identifies technique as a determining factor in modern society, by which he means that every human activity is reduced to a rational search for the most efficient method. In this sense, Ellul seems to suggest that the ideal of rationality and efficiency is the essence of modern technology. However, this is conflating technique with technology. Ellul's concept of technique goes beyond technology. As I showed earlier, the machine is the ideal of technique, but technique refers to much more. This is important, because, if the accusation of essentialism is valid, technique must be a phenomenon that is separate from humans. However, as David Menninger also emphasized, technique is a psychological concept (Menninger, 1981, p. 115). By this he means that technique should not be conceptualized as a phenomenon that exists outside of humans. It may be true that it is out of human control, but it is part of human consciousness. Technique is not a separate phenomenon, but technique has become part of humans. In this sense, it is not the essence of modern technology, but it is rather the way that modern humans interpret the world. If Ellul would think that technique is separate from humans, he would also not write that there is a way out of technique if people become aware enough of its effects. So, Feenberg's accusation of essentialism may be true to the extent that Ellul reduces everything to the aim for efficiency and rationality, thereby ignoring the social constructive reality of technology. However, Feenberg overlooks that Ellul's project is not centered around technology and its essence, but around humans and their sociological reality and determinants.

This also ties in with the accusation of determinism, because Ellul's determinism must be read from a sociological perspective. As I wrote in the situating section of this chapter, Ellul clearly states himself that he sees humans as beings that have always been determined by social forces. His thesis that technique is currently the prime determining factor in the relation between humans, society, and the world, is thereby not an argument that humans can never stop technology. Rather, it is an argument that states that the rational quest for the most efficient method in every domain has entered the way that humans perceive the world to such an extent that it seems impossible to move away from it. Humans are determined by technique in the sense that they are trading spontaneity for rationality and control. Feenberg is correct of accusing Ellul of determinism in the pragmatic sense, namely that Ellul leaves very little pragmatic room for human control. However, theoretically, he is not, because there is room for change and because technique resides in humans rather than independent from humans.

All in all, I argue that *The Technological Society* can be read as a phenomenology of the technical state of mind, as has been noted by the translator (1964, p. 21). Ellul tried to develop an account of *what it is like* to be determined by technique, both as an individual and as a society. Even though he leaves very little room for pragmatic solutions, it is unfair to turn him into a deterministic doomsayer that should not be taken seriously. Ellul's philosophy is very useful as a critique of modern

society, as long as we do not expect solutions from him. He is a good diagnostician, but not a good doctor.

His observation that we are approaching the world, other humans, and ourselves in a machine-like manner since the Industrial Revolution is accurate and built around a thorough historical analysis that is grounded in empirical reality. In a world where we use apps to find love, trackers to be healthy and algorithmic navigators to tell us where to go, Ellul reveals that we are not only using technologies to solve our problems, but that we are approaching a lot of life as problems that we need to solve in a technical way. By conceptualizing technique in a broader way than just concrete artifacts, Ellul reveals that the mediation of technologies on humans and their relation to the world, goes much further than we usually think. Current approaches in philosophy of technology, such as Verbeek's mediation theory (2005), have the tendency to overlook the more collective phenomenology of our technical world, because of its focus on individual artifacts. This is where Ellul's philosophy can be of help. He convincingly describes how the desire to find the most efficient method in a rational way for everything has nested deeply in human consciousness under the influence of the expansion of technique.

In the end, I come to the following interpretation of Ellul's argument about technique as the prime determining factor of modern society. Traditionally, we understand technique as a way of doing something that requires skill. Before the Industrial revolution, technique had a moderately important place in society. In field such as production or hunting, there was a search for the improvement of techniques, in the sense that rational methods were established to for example harvest crops in a more efficient way. However, since the Industrial revolution, technique went from an instrument to a more independent phenomenon. By independent, I mean that it no longer required an external goal or justification to exist. This change in the phenomenon started with the rise of the machine, which embodies the ideal technique: a tool that rationally turns an otherwise unpredictable and spontaneous activity into an efficient procedure that is controllable. This attitude, or mindset, then spread geographically and qualitatively all over the world and into all spheres of human action. The spread of this mindset co-occurred with the material spread of techniques. In the end, this has led to the mechanical relation that humans share with other humans, society, the world, and themselves.

The relation between humans, society, and the world is nowadays determined by the machine-like ideal of finding the most efficient method in a rational way, for everything. Determined here means socially determined, just like humans are determined by money, family, education, status, etc. Ultimately, humans are becoming technical beings today, in the sense that they see themselves and the world as problems that are waiting to be solved in a rational and efficient manner. Humans are approaching the environment and society as something to control with techniques, thereby turning spontaneity and irrationality into predictability and rationality. Technique is then the name for the combination of all the empirical rational methods that aim at efficiency. Taken together, they constitute a determinant (or mediator) of the relationship between humans, society, and the environment. I

understand it as a phenomenological concept; a lens through with the modern human perceives the world.

Two consequences of the determining effects of technique, that I highlighted earlier in this chapter, but wish to highlight again, are the following. Firstly, because humans perceive the world through a technical lens, non-mechanical concepts such as health are turned into mechanical concepts. For instance, health used to be a holistic and spiritual concept, but is nowadays reduced to something that is based on numbers (heart rate, calory intake, long capacity, etc.) that can be controlled in a mechanical way. I will show in the next chapter that the same has happened to innovation, where it went from an uncontrollable and unpredictable concept to an instrument under human control.

Secondly, the development of new techniques (both as machines and as methods) are self-justifying. The mechanical lens of perceiving the world is leading us to take the development of new techniques as self-evident. The clearest example of this is how technologies that bear the promise of more efficiency do not need any other justification to exist than that the technical possibility of their existence is there. In the next chapter, I will show how this self-justifying nature of techniques is true for innovation today. Innovations are, by nature of being innovations, self-justifying and thereby their development is taken for granted. They progress according to what Ellul called their own internal logic, where the interference of morality can only happen as an epiphenomenon.

Chapter 3: Responsible Innovation with Ellul

Introduction

In chapter 1, I have established the conceptual challenge of RI. Innovation is vaguely defined, and when examined closely, refers the process and product of creating new technologies that are marketable. The concept of innovation operates in a techno-economic paradigm. Subsequently, it there is a tension with the second aim of RI, namely, to go move away from a technological concept of innovation. In chapter 2, I have elaborated on the philosophy of Jacques Ellul, who provides an explanation for the technical relation between humans, society, and the environment. In this chapter, I will try to find an answer to my research question. That is: *"How and why is the current understanding of innovation in RI undermining its aim?"* Equipped with the philosophy of Ellul, I will ask two questions in this chapter. First of all, why is RI facing a conceptual challenge that implies technological innovation? And second, how is this undermining the aim of RI?

I will argue that innovation has become a technical concept, in the Ellulian sense. By studying the history of innovation, I argue that the mediating influence of technique has turned innovation from an unpredictable and spontaneous concept into an instrument that humans use to control progress. Moreover, it has gotten a self-justifying status. Analyzing the current conception of innovation in RI in this Ellulian way reveals why it is so difficult to conceptualize innovation in a non-technical way. Moreover, it reveals that there is a strong techno-optimistic bias present in the ethical evaluation of technologies in RI. By going over a case study on *Responsible Killer Robots* (Leveringhaus & Giacca, 2014), I will show how the technical concept of innovation renders the development of new technologies as a neutral given that do not need teleological justification. I will conclude with the suggestion that RI would benefit from including an 'innovation justification' in its process and that a deeper philosophy of innovation is required for this.

The History of Innovation

To make this case, I will start by providing a short history of the concept of innovation. This history will show how the meaning and normative connotation of innovation has changed under the influence of technique. Where innovation used to be a critical political concept that mainly denoted heresy, it is nowadays seen as a technological instrument for progress that carries intrinsic value.

In a recent study, Benoît Godin (1958 – 2021) has provided a history of the concept of innovation (2015). Godin was a Canadian political scientist and sociologist. He held a position as professor at the *Institut National de la Recherche Scientifique*, in Montreal, Canada. He has worked for a long time on the intellectual history of innovation, studying the concept from antiquity to the present.

His main research output from his work is the book *Innovation Contested*, that was published in 2015. His work is relevant for me to use because the intellectual history of innovation can shed light on my research question. If we want to know why innovation is understood in technological terms, it is useful to know if it ever meant something else, and when and how this has changed throughout history. Moreover, since Ellul's philosophy has a historical angle, I can see if his analysis of modern technique upholds itself in light of the history of innovation. If Ellul was right, innovation must have underwent a change in meaning together with the uprise of modern technique.

In the broadest sense, innovation means "introducing change into the established order" (Godin, 2015, p. 5). It expresses human-made change, that is radical, sudden, and violent (Godin, 2015, p. 2). The origin of the concept is Greek. It comes from *kainotomia*, which is derived from *kainos* (new). It meant 'cutting fresh into' and was used as a concrete and abstract word for making or doing new things (Godin, 2015, p. 19). Even though this broad meaning of human-made newness or change has been stable throughout history, the concept of innovation has taken on different interpretations and associated connotations throughout history. Godin argues that the meaning of innovation has varied according to the episteme that it operates in (Godin, 2015, p. 8). In other words, its meaning changes together with the values that are important during a certain time period. Godin calls these time periods and associated values epistemes, and he distinguishes three of them in his work.

The first episteme is the *prohibition episteme*, and this episteme occurred from the reformation to the nineteenth century (Godin, 2015, p. 8). Innovation was seen as revolutionary, heretical, and violent. The concept was used as a word to express critique on people that brought change into the world (Godin, 2015, p. 137). In fact, innovation was even legally prohibited. In 1548 England it was forbidden by law to innovate. King Edward IV issued a *Proclamation Against Those that Doeth Innovate* (Godin, 2015, p. 281). If someone would innovate, punishment and jailtime could follow (Godin, 2015, p. 281). Moreover, the concept had no real theoretical meaning. It was used mainly as an accusation, or "linguistic weapon" (Godin, 2015, p. 138). Innovation was thus mainly a political concept, used to signify someone that was against the status quo. It had no link with technologies or technological change. Godin links this to the value that stability, tradition, respect, and order had before the nineteenth century. Innovations were attempts to disrupt the status quo and seen as a threat to the stability of society. In other words, there was a certain fear for the unpredictable and uncontrollable (i.e. spontaneous) nature of innovations.

During the nineteenth and twentieth century, innovation entered the *instrument episteme*. Between 1750 and 1850, the meaning and connotation of innovation gradually changed under the influence of the French revolution (Godin, 2015, p. 138). Innovation developed a positive connotation once it was defined as progress and utility (Godin, 2015, p. 157). Until then, innovation was used by the elite (for instance King Edward IV) to denote deviating from the status quo. In the instrument episteme, scientists, philosophers, and artists started using the concept to refer to radical progress. Or rather, innovation. became an instrument for progress (Godin, 2015, p. 157). Innovation became a

concept used to denote positive radical change in politics, art, literature, philosophy, science, and technology (Godin, 2015, p. 173). After the French revolution, a change in the political order was not seen as bad anymore. There was a shift in focus from conserving the present to improving the future (Godin, 2015, p. 167). This showed by the fact that innovation was suddenly used to express possibilities for better politics, law, technology, etc. (Godin, 2015, p. 167). Revolution was not seen as a bad thing anymore, but as something to strive for. Innovation came to be seen as an instrument to create revolutions and a new political order.

Nowadays, we are in the *value episteme* of innovation (Godin, 2015, p. 8). Over the last sixty years, innovation has become valuable in itself (Godin, 2015, p. 12). By this, Godin means that innovation is no longer an instrument for progress, it is already progress. Innovation has shifted from a concept with instrumental worth to a concept with intrinsic worth. The worth of an innovation is no longer dependent on the goal that it is supposed to serve. Rather, innovation has become a goal in itself. This has also been described as the pro-innovation bias, where adopting an innovation is seen as desirable (rational) behavior and rejecting an innovation is seen as irrational (Rogers, 1962, p. 142). This thought is now for instance present in the European Union, that is striving to become 'the Innovation Union', where innovations are seen as the solution to the challenges that the union faces (European Commission, 2005).

Importantly, innovation also gets a technological meaning in the value episteme. Where innovation used to refer to change of all kinds, it is nowadays intrinsically linked to technology (Godin, 2015, p. 249). According to Godin, this happened after World War II, when public funding of Research and Development (R&D) increased, because technological innovation was seen as the way forward after the war. Innovation then became the name to refer to the process and outcome of R&D. In 1949, the first technological conception of innovation was put forward by Maclaurin, who defined innovation as a sequential process in time that starts with science and whose ultimate stage is commercialization (Godin, 2015, p. 250).

To conclude, before the nineteenth century, innovation operated in the prohibition episteme. The concept meant introducing change into the established order. It had a negative connotation and was used as a derogatory signifier against people who were threatening the status quo. There was a certain fear associated with the unpredictable nature of innovations. After the nineteenth century, innovation entered the instrument episteme. Innovation was defined as an instrument to bring (positive) change, i.e. progress. The connotation of innovation also became positive. This was because, under the influence of the French revolution, it came to be seen as a means for political and social ends. Change was not seen as bad anymore, and innovation became the way to achieve change. Innovation then became the name for the instrument of positive change in all domains of society: politics, art, literature, science, etc. Since sixty years, innovation operates in the value episteme. Its meaning is reduced to a technological meaning, and innovation is no longer a concept with merely instrumental value. Rather, it has become an intrinsic value, and is seen as positive on its own.

Lessons from the History of Innovation

What does this history of the concept of innovation teach us? I argue with Ellul that it teaches us in four ways that innovation has become determined by technique. First of all, there is historical contingency between the instrument episteme of innovation and the 'uprise' of technique. Secondly, where innovation used to be a political concept to denote something that was unpredictable and threatening, it has turned into a technical concept to denote an instrument for progress. Thirdly, its meaning is reduced to a technological meaning. And finally, innovation has become something that has intrinsic value, and no longer needs to serve another goal than itself. Taken together, I argue that the change in the conception of innovation is caused by technique and how humans nowadays conceptualize the world in a technical way. Ellul's philosophy thereby helps to explains why it is evidently so difficult to move away from a techno-economic concept of innovation. I will not claim that it is impossible, because the history of innovation suggests otherwise, but I do claim that conceptual unclarity will always lead to a technological conception. Thereby, I contribute to the call that RI needs to take a clear stance on the meaning of innovation.

Ellul argued that technique underwent a quantitative and qualitative change after the eighteenth century (1964, p. 157). His point was that technique went from a limited instrument to an unlimited and moreover independent object. In the history of the concept of innovation, there occurred a gradual change from the prohibition to the instrumental episteme around the same time. Where innovation used to mean deviating from the political order, it then became an instrument for progress (Godin, 2015, p. 157). Godin linked this to the French Revolution. Ellul also argued that the independence of technique occurred under the influence of the French Revolution.

Now, the simultaneous change of the meaning of innovation and the objectification of technique could merely be a historical coincidence. However, I argue that the meaning of innovation 'technified' in the Ellulian sense, and this shows that it is more than a coincidence. I will explain below what I mean with technified. Reasoning with Ellul, and his argument that technique became a determining factor in every field of human activity (Ellul, 1964, p. 35), innovation too became determined by technique. And indeed, taking the shift from the prohibition episteme to the instrumental episteme into account, a technification of innovation occurred. By technification, I mean turning something that is spontaneous and irrational into something that is predictable and rational, thereby turning it into a tool for human control. Innovation used to refer to political deviators. Gradually, it came to mean an instrument for change. Innovation went from a critical political concept to an instrumental concept.

When innovation was a critical political concept, it had a bad connotation, because the people in power, such as monarchs, were afraid of the unpredictability of innovations and valued stability and order over unpredictability (Godin, 2015, p. 8). But, once innovation was seen as an instrument, it became a tool that humans can use to achieve progress (Godin, 2015, p. 8). In this sense, the

unpredictability and spontaneity of innovation was mediated by an ideal of control. Innovations turned into useful tools that humans can use to bring progress. Because of this shift from unpredictability and spontaneity to instrumentality and control, it is fair to say that technique has had a mediating impact on the concept of innovation.

Not only the instrumentalization of the concept of innovation is in line with Ellul's argument about technique as a determining factor in contemporary society. The fact that innovation has gotten a primarily technological meaning over the last sixty years is also in line with Ellul's argument. Even though Ellul was clear to differentiate technology from technique, he still saw the machine as the ideal of technique (Ellul, 1964, p. 52). The fact that innovation, that used to mean radical change of any kind, is nowadays merely seen as technological change (as has been argued for by Godin 2015; Von Schomberg 2021; Blok 2021 and me in chapter 1), is a sign that humans conceptualize the world and its problems in a technical way. Innovation is nowadays conceptualized in terms of machines, or technologies. Thereby, innovation embodies the machine-like ideal of technique.

Moreover, Ellul argued that since technique has become an independent reality, it has become self-sustaining or self-augmenting (Ellul, 1964, p. 200). It does not need external justification anymore to expand. In other words, technique no longer needs to serve an external goal in order to justifiably exist. Rather, it justifies itself. It has gotten intrinsic value rather than instrumental value. With innovation, the same has happened over the last sixty years. During the instrument episteme, innovation was an instrument which use was justified by the progress that it was supposed to bring. But since the value episteme, this changed, and innovation has become a goal in itself (Godin, 2015, p. 12). For instance, R. von Schomberg notes in his '*Vision for Responsible Research and Innovation*' that innovation has become a goal in itself (2013, p. 5). In other words, it does not need external justification anymore to expand or to exist. Its value has shifted from instrumental to intrinsic. When something is conceptualized as an innovation, it is by nature already seen as something valuable.

Because of its intrinsic value, innovation has become a term that is inextricably linked with progress. Ellul argued that technique is causing us to mistake human progress for technical progress (Ellul, 1964, p. 201). By this, he meant that the intrinsic value of technique lets us believe that the development of techniques is inherently good and thereby a sign of progress. In other words, progress has come to be determined by technique as well. The same then applies to innovation. Technical innovation is self-justifying in the value episteme, carries intrinsic value, and is thereby seen as human progress. To innovate means to progress.

Concluding, I argue that Ellul provides us with an answer to the why-part of my research question. Innovation is conceptualized in a technological paradigm in RI because innovation has become a technical concept under the influence of technique. First of all, the concept instrumentalized after the eighteenth century together with the objectification of technique. Secondly, the concept 'technified', in the sense that it went from a dangerous and unpredictable concept to a controllable instrument for achieving progress. Thirdly, innovation became intrinsically linked to technology,

thereby embodying the machine-like ideal of technique. Finally, the self-justifying character and intrinsic worth that innovation has gotten during the value episteme is what Ellul called the self-augmentation of technique.

What the above analysis shows is that a technological concept of innovation goes further than innovation being understood in material technological terms. With Ellul I revealed that the concept is technical in the sense that it embodies a machine-like ideal of control and predictability. Secondly, the analysis illustrates how hard it is to move away from a technological understanding of innovation. Because we are living in a time where technique is a determining factor, it is hard to conceptualize innovation in a way that is not linked to technique, machines, or machine-like ideals. In this sense, it is understandable that RI faces a conceptual challenge. In a time where humans conceptualize the world, society, and themselves in a technical way, it is hard to conceptualize innovation in another way.

However, I do not want to conclude that it is impossible. The apparent fluidity in the concept of innovation that is present in the history of innovation suggests that the meaning of innovation can change again in the future. Reasoning with Ellul, this would be extremely difficult, and we would have to hope for a war, divine miracle, or enough awareness of the pervasiveness of technical thinking. I think the latter is the most reasonable and moreover desirable of the three. I hope this thesis can contribute to this aim in a way, but I am at the same time modest here. My aim is mainly to diagnose the problem, and not to provide the solutions. I leave that for future research, but I want to emphasize that my conclusion is not one of deterministic doomsaying.

What I do want to conclude is that as long as innovation is vaguely defined in RI, it will remain to operate in a techno-economic paradigm. Since contemporary humans and society is determined by technique, and since innovation operates in the value episteme, it will always take on a technical meaning, as long as there is no explicit other meaning provided. In this sense, the conceptual challenge of RI is rightfully a challenge, and at odds with its aim to go beyond a technological understanding of innovation. The challenge can be resolved, but there must be more dedicated attention towards it. My thesis can be of help in resolving the challenge, because I have now presented a deeper explanation of the challenge than what has been done before. I show that innovation operates in a technological paradigm because technical thinking is nested deeply in the modern human. If we want to go beyond a technological paradigm, we must tackle the problem at this level. A starting point can be a deeper philosophy of innovation, has recently been attempted by Vincent Blok (2021).

Strong Techno-optimism in Responsible Innovation

I have now answered the *why* part of my research question, but not *how* the current understanding of innovation undermines RI. In this section, I argue that the technical concept of innovation in RI is problematic. It is problematic because of two reasons, that ultimately point to a strong techno-optimistic bias in RI. First, because of the self-justifying nature and intrinsic value of the current concept of

innovation, there is no teleological justification necessary for an innovation to exist. Secondly, it renders the development of new technologies as a neutral given that is necessary for progress. This points to a strong techno-optimistic bias because it is uncritically assumed that technologies are instruments that are necessary for progress. This is problematic, because there is not enough critical reflection on this strong techno-optimism. I will substantiate these claims by going into a case study about responsible killer robots.

I shortly touched on the RI-project of *Responsible Killer Robots* from the Dutch platform for RI (MVI) in the introduction of this thesis. The starting premise from this project is that 'killer robots' will enter modern warfare (Leveringhaus & Giacca, 2014, p. 7). Killer robots are weapons that are designed to harm or threaten to harm the opposing party by disabling, destroying, or killing a target (Leveringhaus & Giacca, 2014, p. 10). This target can be an object like a vehicle, but also a human soldier. Moreover, killer robots are uninhabited, and they can act (at least partly) without a human operator inside them. A human operator can control the robot remotely from a distance, or the robot can be fully automatic and controlled by its software. This is possible because killer robots can perceive their environment and act autonomously (Leveringhaus & Giacca, 2014, p. 10). The aim of the RI-project is to make recommendations for the design of killer robots and to inspire guidelines for their deployment (Leveringhaus & Giacca, 2014, p. 7). The project is funded by the Dutch government, under the platform for responsible innovation. So, the aim of the project is to turn the innovation 'killer robots' into a responsible innovation.

From Ellul's perspective, a lot can be said about killer robots, and the desire to remove the human out of the loop of a weapon to create more precise weapons (with less human error). However, this is beyond the scope of this thesis. Rather, I want to focus on the conceptual level, and critically reflect on the effects of technical concept of innovation on the ethical evaluation of killer robots.

In the report, the authors start from the premise that killer robots will have a place in modern warfare. They write: "robotic weapons are here to stay" (Leveringhaus & Giacca, 2014, p. 7). On the website of the platform of responsible innovation, the project is justified by the claim that "Modern warfare is impossible without advanced information-based decision support systems." (Miller, 2015). There is no other justification for conceptualizing killer robots as innovations besides that modern warfare is impossible without them and that they will be deployed anyway. It is not clear what problem killer robots are supposed to solve, and more importantly what makes them an innovation in the first place.

Two things go wrong in the conceptualization of killer robots as innovations. First of all, there is no justification of conceptualizing killer robots as an innovation. It is not clear why killer robots are seen as an innovation. As I wrote earlier, innovation has become a self-justifying concept since it has entered the value episteme. It is no longer necessary that an innovation fulfills a specific role, or that their existence must be justified by an external goal. That is not to say that there is no possible justification for seeing killer robots as an innovation. There might be one. However, this does not

become clear from the report. And it is the absence of the justification that I want to highlight, not the impossibility of the justification.

This lack of justification is problematic, because, quite simply put, how do we know if an innovation will be of value if there is no teleological justification for their existence? That is to say, if it is unclear what need a new innovation is supposed to satisfy, it is unclear if they are satisfying needs at all. The problem is then that conceptualizing something as an innovation on the one hand leads to the idea that it brings progress, whilst there is at the same time no justification for this belief. Even though the concept of innovation carries intrinsic value, it means nothing more than a new technology. This leads to uncritically taking technologies such as killer robots as bringers of progress, even though it is unclear what this belief in progress is based on, except on an unjustified belief in the intrinsic value of innovation.

Second of all, the self-justifying concept of innovation leads to a problem for the ethical evaluation of innovations. Because of the self-justifying nature of the concept of innovation (in this case the killer robots), the ethical evaluation takes the existence of the innovation as a neutral given. Ellul warned already that the development of new techniques or technologies presents itself as an intrinsic necessity (Ellul, 1964, p. 202), and that technological research and development is a neutral given that "quite simply is" (Ellul, 2003, p. 437). It seems as though this reasoning is present in the case of the responsible killer robots. These robots are here to stay, so we better adapt ourselves and our warfare ethics to them.

The existence of the robots is thereby also taken for granted in the ethical evaluation. The morality of the existence of the robots is not questioned. In a recent paper about autonomy on Facebook through an Ellulian lens, Nolen Gertz concluded along similar lines that this kind of thinking assumes that "the progress of technology cannot harm people, only the application of technology can harm people" (Gertz, 2016, p. 57). Indeed, the authors of the RI report conclude in the end that "Robotic weapons are not unethical as such, but their development and deployment raise a number of substantive ethical concerns" (Leveringhaus & Giacca, 2014, p. 23).

By taking the development of innovations for granted, the moral judgement of innovations in RI concerns itself with questions that arise once the innovation is already implemented. For the killer robots, this is about limiting the possible damage that they can cause. The ethical evaluation in the RI-project focuses specifically on risk mitigation and responsibility gaps (Leveringhaus & Giacca, 2014, pp. 19-23). The issue of risk mitigation is about trying to minimize civilian deaths and other kinds of risks when deploying killer robots. The issue of responsibility gaps concerns the question who is responsible for the actions of a killer robot, taking into account that the killer robot acts (at least in part) autonomously. Both these ethical issues are issues that arise once killer robots are already implemented.

Now, this may seem obvious, because the goal of RI is to guide innovations in a responsible direction. Obviously then the ethical evaluation focuses on issues that arise in the application of an innovation. I agree with this obviousness, and I am not arguing against the use of applied ethics in RI.

However, what I am identifying here is the absence of a more existential ethical discussion about the innovation. I mean by that that the question of the desirability of their existence in the first place is not asked. Why do we need killer robots? What justifies developing them in the first place? The absence of a justification of conceptualizing killer robots as an innovation renders the development of these robots as an amoral given. The technical concept of innovation turns killer robots into a neutral technology that can only cause harm when they are applied.

The case of the killer robots is one example, but the absence of teleological justifications of innovations is present in more RI-projects from the MVI. For instance, the project *Data Mining Without Discrimination* tackles the issue of discriminatory effects of algorithms used by the Dutch police and judiciary (Custers, 2011). However, why such algorithms must be used in the first place, is never asked or argued for. The same goes for projects about political micro-targeting (Helberger, 2022), blockchain (Goossens, 2020), smart urban energy meters (Künneke, 2020), video surveillance, (Van Aalst, 2014). In all these projects, the existence of the innovation is taken for granted, and the moral evaluation focuses on designing the innovation in a way that is responsible. As far as I know, there has never been a RI-project where the innovation was eventually 'stopped'.

Taken together, the absence of a teleological justification, and taking the development of technologies as a neutral given, points to a strong techno-optimistic bias in the concept of innovation in RI. I mean strong techno-optimism in the way that John Danaher recently put it:

> Techno-optimism is the stance that holds that technology, defined here in largely material and instrumentalist terms, plays a key role in ensuring that the good does or will prevail over the bad. (…) The strongest forms of techno-optimism claim that technology plays (or will play) a necessary and sufficient role in ensuring that the good prevails over the bad by a considerable distance (Danaher, 2022, p. 11).

The concept of innovation in RI suffers from strong techno-optimism. First of all, innovation is conceptualized in a technological way. Secondly, it is seen as the solution to modern day problems, so technological innovation apparently plays a key role in making sure that the good will prevail over the bad. Thirdly, innovation is conceptualized in instrumental terms, meaning that a technology or development of a technology is seen as neutral, and that technologies are merely means to achieve some end. As I showed in the above analysis, the development of killer robots and other innovations is seen as neutral, and they only get a moral status in applied context. It is also *strong* optimism, because innovations have a necessary and sufficient role in bringing progress. Exactly because innovation is inherently conceptualized as technological, intrinsically valuable, and seen as *the* solution for modern day problems, technology is necessary and sufficient for progress.

Still, one can object that this does not go against the aims of RI, namely, to make innovations and the innovation process ethically acceptable, sustainable, or socially desirable direction. This is fair, because this aim goes hand in hand with the idea that technological development is a guarantee and that

we can only guide it in a certain direction. However, the second and more fundamental aim of RI is to transform the concept of innovation into a concept that is not dictated by techno-economic incentives (Von Schomberg, 2022, p. 2015). What I have shown now is that the conceptual challenge implies an implicit concept of innovation that operates in a technological paradigm that has a strong techno-optimistic bias as a consequence. The current conception of innovation is thereby fundamentally at odds with the second aim of RI.

Because L. Von Schomberg has not explained the conceptual challenge, nor mapped its consequences for RI, there is so far no awareness or reflection on this strong techno-optimism. Von Schomberg and Blok have argued before that innovation operates in a technological paradigm (Von Schomberg & Blok, 2021; Blok, 2021). However, they do not see that the consequence of this technological paradigm is that there is no teleological justification for innovations, and that the development of innovations as new technologies is in a sense immune for moral intervention. The strong techno-optimism that the concept of innovation suffers from is hidden in the concept, operating on an implicit level. This is why I call it a bias. The implicit nature of the strong techno-optimism in innovation leads to mistaking strong techno-optimism for neutrality. Therefore, again, the debate in RI would benefit from a more thorough conceptual philosophical underpinning of innovation. My argument helps to see the current philosophical underpinnings of innovation, and shows the urgency of another philosophical underpinning of innovation.

In conclusion, the technical concept of innovation is problematic because it uncritically renders innovations into technologies which development or existence is taken as an amoral given. Through the case study of *Responsible Killer Robots*, I showed how the development of these robots is taken as a neutral fact, and how this leads to the absence of a teleological justification of conceptualizing killer robots as an innovation in the first place. I highlighted the same absence in other RI-projects of the Dutch Platform for Responsible Innovation. Thereby, I identified a strong techno-optimistic bias in RI, meaning that innovations (technologies) are seen as neutral instruments that are needed for progress. This is problematic because the strong techno-optimism is hidden in the conceptual vagueness of innovation. Thereby, there is not enough critical reflection on this techno-optimism.

Conclusion

In this chapter, I found an answer to my research question. First, I asked why innovation in RI is currently operating in a technological paradigm, even though there is a clear aim to move beyond this kind of thinking. By going over the history of the concept of innovation, I showed how it turned from an unpredictable and spontaneous concept that denoted political heresy into an instrumental technological concept that is associated with progress and carries intrinsic value.

I argued that this change in meaning happened under the influence of technique. The historical timing of the change in meaning and the nature of the change in meaning suggest that the concept of

innovation 'technified'. Since the industrial revolution innovation has become a technical concept that denotes an instrument for progress, it has a technological meaning, and carries intrinsic value.

Studying the history of the concept of innovation through this Ellulian lens, revealed an answer to the first part of my research question. Innovation is conceptualized in a technological paradigm, because humans are nowadays conceptualizing their relation to the world through a technical lens. The contemporary concept of innovation has the characteristics that Ellul identified as characteristics of a world that is determined by technique. This shows why innovation is operating in a technological paradigm, and it moreover shows why it is so hard to move away from this paradigm. Since technique has power over our thinking, it is hard to move away from it. I however concluded that it is not impossible, because the fluidity of the concept of innovation throughout history suggests otherwise. Change is possible in the future. But, as long as RI suffers from the conceptual challenge, and does not reflect enough on the concept of innovation, it will remain to operate in a technological paradigm.

I then moved on to the second part of my research question, namely how the current concept of innovation undermines the aims of RI. Here, I argued that the self-justifying nature of the current concept of innovation is keeping us from justifying why something is conceptualized as an innovation in the first place, and that it renders the development of new technologies as a neutral given. I substantiated this claim by going over a case study on *Responsible Killer Robots*, where I showed that the development and existence of such robots is taken for granted, and that a teleological justification of the innovation is absent. The same goes for other RI-projects. Taken together, I argued that the current concept of innovation suffers from a strong techno-optimistic bias, and this translates itself into the ethical evaluation of innovations too. It is uncritically assumed that innovations are technologies, that technologies are necessary for progress, and that the development of these technologies is a neutral given. This is problematic, because there is not enough awareness and reflection of this optimism.

Conclusion

The aim of this thesis was to get an understanding of the conceptual challenge of Responsible Innovation. This challenge entails that the concept of innovation is not or vaguely defined in RI, even though the conceptualization of innovation is epistemically and politically relevant. Moreover, even though there is a clear aim in RI to move beyond a techno-economic concept of innovation, it seems like RI is stuck in a techno-economic paradigm. The key objective of my thesis was to understand the conceptual challenge of RI, and specifically to understand why innovation operates in a technological paradigm. Its second aim was to examine what the consequences of the conceptual challenge and implied technological paradigm are for the aims of RI. To recap, this was the research question that I asked at the beginning of this thesis:

How can an Ellulian analysis help us to understand the conceptual challenge of 'Responsible Innovation' and reveal its consequences for RI?

I answered my research question in three chapters, that all corresponded to one or more sub-questions. These were:

1.
    a. What is the conceptual challenge of RI
    b. and which conceptualization of innovation is currently implied in RI?
2. How can Ellul's Technological Society be interpreted to understand the conceptual challenge of RI?
3.
    a. Why is RI stuck in the conceptual challenge
    b. and how does this affect the aims of RI?

Let me now briefly answer these sub-questions, thereby providing a short summary of my thesis, and end with an answer to my research question. In chapter one, I explained the conceptual challenge of RI. I started with a short description of RI, where I highlighted the aims and defining characteristics. Shortly stated, RI is one of the flagships of the European Union. Innovations are seen as the solution to modern day problems, but there is awareness of possible irresponsible effects of innovations. Hence, RI has as a first core aim to make innovations responsible (i.e. ethically acceptable, sustainable, and socially desirable). A second core aim is to move beyond a concept of innovation that is determined by techno-economic incentives, because determining the success of an innovation based on those incentives does not sufficiently take the public good into account. By making the innovation process anticipatory, reflexive, inclusive, and responsive, the hope is that innovations will become more responsible. I

highlighted then that the literature surrounding RI focuses on the responsible side of RI, but not on the innovation side. This lack of conceptual clarity and discussion about the concept of innovation has been coined the conceptual challenge of RI. Upon close inspection, I argued that innovation currently implicitly means 'a process that leads to technological products (that we call innovations) that come into existence dependent on the success they have on the market, that and must lead to economic progress. After situating this argument in recent literature, I concluded that innovation in RI operates in a techno-economic paradigm. Thereby, there is conceptual ambiguity between the ideal of RI and the practical use of the concept of innovation. I was also critical of L. Von Schomberg, who coined the conceptual challenge, but does not give a satisfying explanation for it. In order to solve the conceptual challenge, a thorough understanding of it is necessary. This is why I bestowed myself in this thesis with the task to understand the conceptual challenge, and to specifically understand why innovation is understood in technological terms.

To find out where the apparent inability to move away from a technological concept of innovation comes from, I turned to the philosophy of Jacques Ellul in chapter two. I specifically went into his work *The Technological Society* (1964). I argued that *The Technological Society* can be read as a phenomenology of the technical state of mind. Ellul articulated well how the relation between humans, society, and their environment have become 'technical' under the influence of what he called 'technique'. A technique refers to rationally finding the most efficient method to achieve some end. This can be a machine, or a technology, but also a way of doing something. Ellul then used the term 'technique' to refer to the combinations of all techniques. Since the Industrial Revolution, the application of the machine and moreover a machine-like approach to the world has become dominant and ubiquitous in Western societies. Humans have become determined by the power of technique, and now strive to rationally find the and most efficient method for everything. Humans have become obsessed with turning the spontaneous and unpredictable into the controllable and predictable. This leads to two consequences that I pointed out. First, humans nowadays turn non-mechanical concepts (such as innovation) into mechanical concepts. Second, the development of new techniques is self-justifying and does not serve extrinsic goals anymore. I then argued that it is unfair to accuse Ellul of essentialism and determinism, thereby not taking his philosophy seriously. I concede that his philosophy is not suitable for finding solutions to the problems he raises, but his critique is relevant to this day, especially to find out why RI is facing a conceptual challenge and has so far been unable to rethink innovation in non-technological terms.

In my third and final chapter, I found an answer to my research question. First, I asked why RI is stuck in the conceptual challenge. Specifically, I asked why innovation in RI is currently operating in a technological paradigm, even though there is a clear aim to move beyond this kind of thinking. By going over the history of the concept of innovation, I showed how it turned from an unpredictable and spontaneous concept that denoted political heresy into an instrumental technological concept that is associated with progress and carries intrinsic value. I argued that this change in meaning happened

under the influence of technique. The historical timing of the change in meaning and the nature of the change in meaning suggest that the concept of innovation 'technified'. Since the industrial revolution innovation has become a technical concept that denotes an instrument for progress, it has a solely technological meaning, and carries intrinsic value.

Studying the history of the concept of innovation through this Ellulian lens, revealed an answer to the first part of my research question. RI is stuck in a conceptual challenge, because the power that modern technique has over our conception of innovation makes it difficult to conceptualize it in non-technical terms. Innovation is conceptualized in a technological paradigm, because humans are nowadays conceptualizing their relation to the world through a technical lens. The contemporary concept of innovation shares characteristics that Ellul identified as characteristics of a world that is determined by technique. This shows why innovation is operating in a technological paradigm, and it moreover shows why it is so hard to move away from this paradigm. I however concluded that it is not impossible, because the fluidity of the concept of innovation throughout history suggests otherwise. Change is possible in the future. However, this asks for a serious answer to the conceptual challenge of RI, and a more thorough philosophy of innovation.

I then moved on to the second part of my research question, namely how the current concept of innovation undermines the aims of RI. Here, I argued that the self-justifying nature of the current concept of innovation is keeping us from justifying why something is conceptualized as an innovation in the first place. Moreover, it renders the development of new technologies as a neutral given. I substantiated this claim by going over a case study about *Responsible Killer Robots*, where I showed that the development and existence of such robots is taken for granted, and that thereby a teleological justification of the innovation is absent. This absence of a justification of innovation undermines an aim of RI, namely, to move away from a techno-economic concept of innovation. I then argued that the current concept of innovation suffers from a strong techno-optimistic bias, and this translates itself into the ethical evaluation of innovations too. It is uncritically assumed that innovations are technologies, that we need technologies for progress, and that the development of these technologies is a neutral given. Since the conceptual challenge has not been explored in this detail before, there is no awareness of this strong techno-optimism, and this is problematic. The absence of awareness and deliberate choice for techno-optimism leads to mistaking techno-optimism for 'neutrality'. Other types and connotations of innovation are thereby not taken into consideration.

Thus, I come to the following answer to my research question. The current conceptualization of innovation in Responsible Innovation is vague, but implicitly refers to the process and product of creating new marketable technologies. The conceptual challenge thereby implies that innovation operates in a techno-economic paradigm. This is the case because innovation turned from a spontaneous and unpredictable concept with a bad connotation to an instrument for progress with a self-evident good connotation, under the influence of modern technique. The technical concept undermines the aim of RI, because it keeps innovation from moving away from technological thinking. Secondly, the self-

justifying character of innovation undermines the teleological justification of innovations and renders the development of new technologies as a neutral given. All in all, there is a strong techno-optimistic bias present in evaluating innovations with RI. The development of new technologies is seen as a neutral given and technologies are seen as necessary and sufficient for the solution of modern-day problems. The absence of awareness and reflection on this strong techno-optimism is problematic.

Limitations

Before I move onto directions for future research, I wish to highlight two limitations of my thesis. The first is my focus on the 'technological' component of the techno-economic paradigm of innovation rather than also taking the economic component into account. To get a full picture of understanding the techno-economic paradigm, it would have been helpful to study the economic side of the paradigm too. I agree with this, but I wanted to avoid an anti-capitalistic framing of my thesis, since that would have been the obvious route to take. The dominance of technical thinking, especially in Ellulian terms, is researched less, and I hope to have shown that it is still a useful route to take. Still, future research should also take the economic component into account and could for example take a more Marxist approach to the conceptual challenge of RI.

A second limitation, one that I also highlighted in chapter 2 and 3, is that this thesis does not provide any solutions for the problems that it raises. This is a limitation that comes with using the philosophy of Ellul. As I wrote before, he is a good diagnostician, but not a good doctor. Moreover, his focus on Technology as an abstract societal phenomenon rather than concrete artifacts makes it hard to translate his philosophy into practical solutions. This is indeed a limitation, and the recent trend in our field is therefore to focus more on concrete technologies. However, it was never the goal of this thesis to provide solutions to the conceptual challenge of RI. The goal was to understand the challenge better, and I believe it succeeded at that goal. In this sense, I also think that philosophical approaches that focus on technologies and approaches that focus on Technology should not be thought of as mutually exclusive. Both should have a place, because their strengths are complementary, and their functions differ. Ellul's philosophy is useful for providing a critical sociopolitical stance on the relation between humans and technology, whereas an approach like postphenomenology is better suited for providing practical guidelines that can be implemented for example in design.

Still, it is frustrating to leave my reader with perhaps a sense of pessimism. I do want to say that it would be a misinterpretation of my thesis to think of it as a techno-pessimistic work. I am not arguing against technological thinking, or against the use of technologies for solving the problems in the world. I am also not arguing that we are moving towards a world of techno-deterministic doom, and that we cannot do anything about it. My argument takes a more nuanced stance and does not fall into any of the 'optimist / instrumentalist / pessimist' camps. What I have aimed to do is mainly to raise awareness on the current assumptions and concepts that RI is working with. I am arguing for a more

thorough reflection on the current techno-optimism, but that does not mean that I am arguing against techno-optimism per se.

The Future of Responsible Innovation

Let me now finish with some directions for the future of RI. As I just wrote, I hope this thesis will mainly be read as a plead for more awareness of the assumptions and concepts that are now used to refer to innovation in RI. If RI wants to achieve its aims, there needs to be more awareness about the concept of innovation. So far, the conceptual challenge of RI has been raised and explained, and that is a good first step. When scholars working on RI become aware of the problem and where it comes from, they can start to think about solving it too.

Therefore, a second direction that RI research should take, is to develop a philosophy of innovation. Since innovation is such a central concept in our time, it is a task for philosophers to develop a concept that does justice to what we want it to mean. Leaving innovation as the vague concept that it is now is a sign of philosophical laziness, and this laziness is harmful to the aims of RI. I therefore urge future research to take up the task of conceptualizing innovation and provide a well argued for philosophical underpinning of the concept. For instance, asking ourselves if innovations are always technological, if they are controllable or spontaneous, if they have intrinsic or instrumental value, etc. *Not* taking a stance is taking a strong techno-optimistic stance. Taking this stance without justification is problematic.

To give a suggestion, I believe that the work of Hannah Arendt (1906 – 1975) would be a good starting point for conceptualizing innovation. In *The Human Condition* (1958) she provides an argument for the human capacity for action, i.e. starting something completely new and unpredictable. She roots this in the idea of natality, that something unexpected and spontaneous can always be born. I think this could do justice to the original concept of innovation, when it was a more political concept that denoted spontaneity and unpredictability.[11] Moreover, her work on 'promising' and 'forgiving' as ways to deal with the unpredictability of action (Arendt, 2013, p. 237) seem like a promising starting point to think about innovation as something that is uncontrollable but still manageable or responsible.

There is one thought that I want to end this thesis with. It is the main lesson that I personally have taken away from reading Ellul and applying his work to the concept of innovation in RI. And I believe that it is a relevant lesson to learn for all philosophers of technology. Ellul has taught me that some modesty is in place about our capacity to change and influence the course of technological development. Even though we may not like it, we as humans are only a part of a network of forces that together determine the development of technology. It is not the case that humans are in full control of technology. Rather, technological development is determined by social structures, political powers,

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[11] There has recently been a promising attempt to do this by L. von Schomberg (2022). Future research could take this as a starting point and develop the account more thoroughly.

economic incentives, even by technological development itself. Us humans, us philosophers, only have a little role in this interplay of sociotechnical forces.

Literature

Arendt, H. [1958] (2013). *The Human Condition*. University of Chicago Press.

Blok, V. (2021). What Is Innovation?: Laying the Ground for a Philosophy of Innovation. *Techne: Research in Philosophy and Technology*, *25*(1), 72-96.

Blok, V., & Lemmens, P. (2015). The emerging concept of responsible innovation. Three reasons why it is questionable and calls for a radical transformation of the concept of innovation. In B.J. Koops, I. Oosterlaken, H. Romijn, T. Swierstra, J. van den Hoven (Eds.). *Responsible innovation 2* (pp. 19-35). Springer, Cham.

Cambridge University Press. (2022). Innovation. In *Cambridge dictionary*. URL https://dictionary.cambridge.org/dictionary/english/innovation Accessed June 10 2022.

Custers, B. (2011). *Data Mining Wihout Discrimination*. Platform for Responsible Innovation. https://www.nwo-mvi.nl/project/data-mining-without-discrimination Accessed Sept 4 2022.

Danaher, J. (2022). Techno-optimism: an analysis, an evaluation and a modest defence. *Philosophy & Technology*, *35*(2), 1-29.

Ellul, J (2003) The 'autonomy' of the technological phenomenon. In: R.C. Scharff & V. Dusek. (Eds.) *Philosophy of Technology: The Technological Condition*. (pp. 430–441). Malden: Blackwell Publishing Ltd,

Ellul, J. (1976). *The Ethics of Freedom*. (G. Bromiley, Trans.) Eerdmans.

Ellul, J. [1954] (1964). *The Technological Society*. (J. Wilkinson, Trans.) Vintage Books. New York.

European Commission. (2010). *Research and Innovation Strategy*. Brussels: EU. https://ec.europa.eu/info/research-and-innovation/strategy/strategy-2020-2024_en Accessed 20 April 2022.

European Commission. (2017). *Why Do We Need an Innovation Union?* Brussels: EU. https://ec.europa.eu/info/research-and-innovation/strategy/past-research-and-innovation-policy-goals/innovation-union_en Accessed 21 April 2022.

European Commission. (2020). *Horizon 2020: Work program 2016-2017: Science with and for society.* Resource document. Accessed 10 June 2022.

Feenberg, A. (1999). *Questioning Technology*. London, England: Routledge.

Fisher, E., & Rip, A. (2013). Responsible Innovation: Multi-Level Dynamics and Soft Intervention Practices. In R. Owen, J. Bessant & M. Heintz (Eds.). *Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society*, (pp. 165-183). John Wiley & Sons.

Frodeman, R. (2019). International handbook on responsible innovation. *Journal of Responsible Innovation, 6*(2), 255-257.

Gertz, N. (2016). Autonomy online: Jacques Ellul and the Facebook emotional manipulation study. *Research Ethics*, *12*(1), 55-61.

Godin, B. (2015). *Innovation contested: The idea of innovation over the centuries*. Routledge.

Goossens, J. (2020). *Blockchain in the Network Society.* Platform for Responsible Innovation. https://www.nwo-mvi.nl/project/blockchain-network-society-search-transparency-trust-and-legitimacyAccessed Sept 4 2022.

Grunwald, A. (2010). From speculative nanoethics to explorative philosophy of nanotechnology. *NanoEthics*, *4*(2), 91-101.

Grunwald, A. (2019). Responsible innovation in emerging technological practices. In R. von Schomberg & J. Hankins (Eds.). *International Handbook on Responsible Innovation*. (pp. 326-383). Edward Elgar Publishing.

Helberger, N. (2022). *How Critical Micro-targeting Influences Dutch Democracy.* Platform for Responsible Innovation. https://www.nwo-mvi.nl/project/safeguarding-democratic-values-digital-political-practices Accessed Sept 4 2022.

Huesemann, M., & Huesemann, J. (2011). *TechNo-fix: Why Technology Won't Save Us Or the Environment*. New Society Publishers.

Künneke, R. (2020). *Smart Urban Energy Systems.* Platform for Responsible Innovation.

https://www.nwo-mvi.nl/project/capturing-societal-value-smart-energy-systems   Accessed
Sept 4 2022.

Leveringhaus, A., & Giacca, G. (2014). Robo-Wars: the regulation of robotic weapons. *Oxford Martin Policy Paper.*

Lupton, D. (2016). *The Quantified Self.* John Wiley & Sons.

Engelhard, M., Schroeder, D., Schrempf, B., Lingner, S., Coles, D. (2015). *Consensus report on globalisation/regionalisation priorities for innovation, a report for ProGReSS*. Resource document. URL = https://www.progressproject.eu/wp-content/uploads/2020/09/PROGRESS D2_3-Innovation-policies-convergence-updated.pdf

Menninger, D. (1981). Politics or technique? A defense of Jacques Ellul. *Polity*, *14*(1), 110-127.

Merton, R. (1964). Foreword to Jacques Ellul. In J. Ellul (Ed.) *The Technological Society*. (pp. 8-13). Vintage Books. New York.

Miller, S. (2015). *Responsible 'Killer Robots'?*. Platform for Responsible Innovation. https://www.nwo-mvi.nl/project/military-human-enhancement-design-responsibility-and-combat-systems Accessed June 15 2022.

Naudé, W., & Nagler, P. (2016). *Is technological innovation making society more unequal?* United Nations University. https://unu.edu/publications/articles/is-technological-innovation-making-society-more-unequal.html

OECD. (2005). *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*, 3rd edition. Paris/Brussels: OECD/EC.

OECD. (2010). *Innovation and the Development Agenda*. Paris: OECD.

Owen, R., Stilgoe, J., & Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy*, *42*, 1568-1580.

Owen, Richard and Mario Pansera (2019), 'Responsible innovation. Process and politics', in René von

Schomberg and Jonathan Hankins (eds), *International Handbook on Responsible Innovation: A Global Resource*, (pp. 35-48). Edward Elgar Publishing.

Phelps, E. (2009). Economic justice an the spirit of innovation. *First Things: A Monthly Journal of Religion and Public Life*, *196*, 27-32.

Platform for Responsible Innovation. (2022). *Mission.* NOW-MVI. https://www.nwo-mvi.nl/mission Accessed June 15 2022.

Plato, (1997), *Complete Works*, (J.M. Cooper & D.S. Hutchinson, Eds & Trans.), Indianapolis: Hackett.

Rogers, E.M. (1962), *The Diffusion of Innovation* , New York: Free Press.

Ruckenstein, M., & Schüll, N. D. (2017). The datafication of health. *Annual Review of Anthropology, 46*, 261-278.

Settle, J. E. (2018). *Frenemies: How social media polarizes America*. Cambridge University Press.

Sismondo, S. (2010). *An introduction to science and technology studies* (Vol. 1). Chichester: Wiley Blackwell.

Son, W. C. (2013). Are we still pursuing efficiency? Interpreting Jacques Ellul's efficiency principle. In H.M. Jerónimo, J.L. Garcia, C. Mitchham (Eds.). *Jacques Ellul and the technological society in the 21st century* (pp. 49-62). Springer, Dordrecht.

Van Aalst, I. (2014). *A Safe Night Out & Video Surveillance.* Platform for Responsible Innovation. https://www.nwo-mvi.nl/project/surveillance-urban-nightscapes Accessed Sept 8 2022.

Van Balen, B. (2021). *Responsible 'Innovation' Revised.* [Unpublished class assignment]. University of Twente.

Verbeek, P. P. (2005). *What things do: Philosophical reflections on technology, agency, and design*. University Park: Pennsylvania State University Press.

Von Schomberg, L. (2021). Challenges for responsible innovation. In B. Godin, D. Vinck, & G. Gaglio

(Eds.). *Handbook on Alternative Theories of Innovation*. (pp. 19-35). Edward Elgar Publishing.

Von Schomberg, L. (2022). Raising the sail of innovation: Philosophical explorations on responsible innovation (Doctoral dissertation, Wageningen University).

Von Schomberg, L., & Blok, V. (2021). The turbulent age of innovation. *Synthese*, *198*(19), 4667-4683.

Von Schomberg, R. (2013). A vision of responsible innovation. In R. Owen, M. Heintz & J. Bessant (Eds.) *Responsible Innovation*. (pp. 51-74). London: John Wiley.

Von Schomberg, R., & Hankins, J. (Eds.) (2019). *International handbook on responsible innovation: A global resource*. Edward Elgar Publishing.

Zwart, H., Landeweerd, L., & Van Rooij, A. (2014). Adapt or perish? Assessing the recent shift in the European research funding arena from 'ELSA'to 'RRI'. *Life Sciences, Society and Policy*, *10*(1), 1-19.