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Virtue Ethics for Responsible Innovation

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Abstract: Governments and companies are increasingly promoting and organizing Responsible Innovation. It is, however, unclear how the seemingly incompatible demands for *responsibility*, which is associated with care and caution, can be harmonized with demands for *innovation*, which is associated with risk-taking and speed. We turn to the tradition of virtue ethics and argue that it can be a strong accomplice to Responsible Innovation by focussing on the agential side of innovation. Virtue ethics offers an adequate response to the epistemic and moral complexity in innovation and encourages moral behaviour. We enumerate a number of virtues that people involved in Responsible Innovation would need to cultivate both related to *responsibility*, such as justice, anticipation, civility and inclusion, and virtues related to *innovation*, such as courage, dedication, curiosity and creativity. We put forward *practical wisdom* (*phronesis*) as a key virtue to regulate relevant virtues and to deal with the tension between responsibility and innovation. Practical wisdom helps an agent to find an appropriate *mean* in exercising and expressing the other virtues—where the *mean* is relative to the specific context of action and the role and abilities of the agent.

Key Words: responsible innovation, virtue ethics, practical wisdom, exemplars

1. Introduction

Are innovators virtuous or vicious? Let us consider two well-known innovators: Steve Jobs and Elon Musk. Steve Jobs, who steered Apple against many established trends of Silicon Valley, was known for his temper tantrums, secrecy,

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and for creating an atmosphere of fear amongst employees (Isaacson 2011). WIRED magazine termed Jobs's relationship with the public and the press as "radical opacity" and suggested that despite rejecting some major ideals of Silicon Valley ("Embrace open platforms. Trust decisions to the wisdom of crowds. Treat your employees like gods."), he has proven that "evil can be successful" (2008). Elon Musk founded numerous companies (e.g., PayPal, SpaceX, Tesla, SolarCity, Hyperloop, The Boring Company) and his ambitions are large: to transition from fossil fuels to solar energy; to mainstream electric cars and pioneer underground public transport; and, rather controversially, to colonize Mars. One can associate virtues like *courage*, *creativity*, and *dedication* with Jobs, Musk and entrepreneurs like them. At the same time, one can associate them with vices like *recklessness*, an excess of courage, *or obsession*, an excess of dedication.

Alternatively, we can look at innovators like Yvon Chouinard, founder of Patagonia, the outdoor apparel company. An accomplished rock climber himself, Chouinard started Patagonia out of his love for being in nature and his love for high-quality equipment (Chouinard 2016). He made Patagonia a B Corporation ("business as a force for good") and supported all sorts of environmental activism with his company. Or we can look at Yancey Strickler, cofounder and former CEO of crowdfunding platform Kickstarter. Strickler wanted to create a platform based on creativity, collaboration and support—not one that strives only for money: a platform, where lovers of art and creators of art can meet (Strickler 2019). One can associate innovators like Chouinard and Strickler with virtues like *care*, for nature (Patagonia) or for artists (Kickstarter), temperance, e.g., *not* be seduced by maximizing growth or profit, or *cooperation*, e.g., in environmental activism or the creation of art.

Innovation is often associated with speed and acceleration (Kurzweil 1999: 388, Cressman 2019: 32), rather than with care and caution. Joseph Schumpeter, one of the founders of innovation theory, characterized innovation as destructive in that it causes the decline of existing industries and infrastructures (Schumpeter 1983, Blok 2021). Nowadays, it has become mainstream to seek disruptive effects through innovation: "As a business model, disruptive innovation allowed the theory's proponents to turn their attention away from defending firms against disruptive innovation towards strategizing how to succeed through disruptive innovation" (Cressman 2019: 24). An underlying motivation for disruption is a fear to be left behind (Cressman 2019: 32). In any case, whether courage or fear is driving innovation, there seems to be little room for sober reflection and a balanced, critical approach to innovation. Zibarras et al. (2008) even found a

correlation between (self-reported) innovation characteristics and dysfunctional personality traits: "Arrogant, Manipulative, Dramatic and Eccentric correlated positively; and Cautious, Dependent and Perfectionist correlated negatively with innovative characteristics" (Zibarras et al. 2008: 211). Is there room in innovation for (classical) virtues, such as moderation, prudence and justice?

In this paper, we focus on one particularly interesting and topical governance approach to innovation: *Responsible Innovation*. Taking this term at face value, one can identify a *Responsible*-side, which we associate with care, caution and slowness, and an *Innovation*-side, which we associate with speed, risk-taking and presumptuousness. While *Responsible Innovation* (RI) can be understood as an alternative to the Silicon Valley approach to innovation associated with Facebook's initial slogan "*Move fast and break things*"—the antonym of responsibility—its two constitutive components seem to perpetuate the tension mentioned throughout this introduction.

We aim to address the following questions: How—if at all—can virtue ethics help to harmonize the seemingly incompatible demands for responsibility and innovativeness in Responsible Innovation? Which character traits are commendable for people involved in RI?

We believe that a proper understanding and emphasis of the role of practical wisdom can show that virtue ethics provides a conceptual solution to the above-mentioned tension and supports RI with its focus on agents. In order to defend this view and answer our research questions, we will first introduce the topics of RI and virtue ethics in sections 2 and 3. Virtue ethics focuses on individuals in RI, including e.g., innovators, entrepreneurs, researchers and developers, and their cultivation of specific virtues.

We will discuss a range of virtues that people involved in RI need to cultivate in section 4. After that, we will discuss the role of practical wisdom in regulating these virtues, in order to aim for the *mean* for each relevant virtue (which is *not* the arithmetic middle, as we will show), in section 5. By clarifying the relationship between innovativeness and responsibility through the lens of virtue ethics, we strengthen the case for virtue ethics as a powerful accomplice to RI.

2. Responsible Innovation

In recent years, RI[1] has become a key concept in the European governance of science and technology and established itself as a "cross-cutting issue" (Owen et al. 2012).[2] In opposition to a focus on the responsibility of *individual* researchers or innovators, which are powerless and epistemically limited in the context

of global innovation, RI suggests a focus on the social *interactions* between those agents, stakeholders and research institutions (von Schomberg 2013). Through means of *inclusion* and *reflexivity*, stakeholders involved in innovation can become "mutually responsive" to each other. Aside from inclusion and reflexivity, *anticipation* and *responsiveness* are put forward as key dimensions of RI (Stilgoe et al. 2013).

This *process* dimension of RI is complemented by a *product* dimension that suggests that the implementation of such procedural aspects in innovation leads with higher probability to more sustainable and socially robust and desirable innovations (von Schomberg 2013: 65, Van de Poel and Sand 2018). RI aims for creating innovations that reflect societal values at large, rather than only values of a particular interest group or market actor. Those values are expressed, for instance, in the *Charter of the Fundamental Rights of the European Union*. Von Schomberg's vision can be contrasted to a market-driven approach, with a very narrow risk-assessment approach to governance of innovation (von Schomberg 2013: 63):

> Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other regarding the ethical acceptability, sustainability and social desirability of the innovation process and its marketable products. . . . Responsible Research and Innovation shifts the focus from research and development of particular technologies and/or particular risks towards the whole innovation process, and its governance which is neither technology-specific, nor solely risk-focused.

Von Schomberg emphasizes in several of his papers that "an ethics focused on the intentions and/or consequences of actions of individuals is not appropriate for innovation" (von Schomberg 2013: 59). The rejection of consequentialism is one of the most important motivations for promoting the collective endeavour of fostering mutual responsiveness amongst the multiplicity of actors involved.

However, whenever normative demands and responsibility issues arise, the agential side cannot be entirely eliminated in RI. There are two reasons for this: The first has to do with the nature of moral demands, which can be meaningfully addressed only to agents. One cannot meaningfully request an innovation *system* to become more inclusive, but one can address such request at *people*, who have partial control of such systems to instantiate change and alter those systems in the desired direction (Sand 2018a: 246). Responding to such moral demands requires the ability to respond to reasons and decide, whether and how to pursue the imposed demands. Second, while RI advocates changes in the

innovation system to induce more socially desirable and robust innovations, an increased willingness to assume responsibility, by agents, is clearly also one of the goals of implementing the four previously mentioned dimensions (inclusion, reflexivity, anticipation, responsiveness) in the innovation system. We can find an expression of the ambition to change the mindset and behaviour of involved agents in the following description of the Directorate-General for Research and Innovation of the European Commission (2013: 55):

> Strictly speaking it is not the innovation itself that is responsible. Responsible innovation is a truncated and indirect way of referring to contexts in which people are the appropriate subjects of responsibility claims and who either feel responsible, or who can be held or can be made responsible. 'Responsible innovation' can thus be used to refer in the realm of innovation to whatever invites, accommodates, stimulates, enhances, fosters, implies or incentivizes responsible action and the mental states that are typically associated with it.

We see how the agential side of innovation constitutes a crucial aspect of this governance framework. RI intends to stimulate responsible behaviour and encourage individuals to assume responsibility beyond the mere compliance with positive legal frameworks and traditional role responsibilities such as those of engineers, scientists and policy-makers. In the innovation context, those traditional roles are blurred and the sphere of influence of individuals in these fields often transcends the boundaries of their profession. But, what exactly does it mean to become mutually responsive, to act responsibly and to have the required dispositions or virtues? In the following section, we will turn to virtue ethics to answer these questions.

Foreshadowing our argument below, we believe that a view on individuals' (moral) agency, which seems to be dominant in the domain of business (Atkins and Caldwell 2020), goes well together with a virtue ethics approach.[3] We therefore also believe that virtue ethics can help to move RI from the domain of governance, where it originated, towards the domain of business—a move that was pioneered, amongst others, by Blok, Brand, Lemmens, Lubberink, Van Ophem and Omta (Blok and Lemmens 2015, Lubberink et al. 2017, Brand and Blok 2019, Lubberink et al. 2019).

3. Virtue Ethics

There are at least two arguments why virtue ethics is a suitable accomplice to the agential side of RI. First, while any moral theory aims to guide individuals to achieve valuable outcomes, the complex domain of innovation leaves one at

a loss on how to act. Here, von Schomberg rightly criticized consequentialist theories as being incapable of providing meaningful guidance (2013: 56). As in the realm of environmental ethics, where complexity and potential causal inefficacy produce challenges to determine the right conduct and moral duties, virtue ethics has frequently been suggested as a more pragmatic and realistic (in terms of the demands that limited human agents can satisfy) framework to cope with this (Jamieson 2007, Knights 2019). Second, the domain of innovation entails enormous normative uncertainty; innovating means, among other things, creating new artefacts, ideas and socio-technical assemblages, which are inherently difficult to consider and understand before their emergence and diffusion, and which challenge existing moral norms and regulatory frameworks (Sand 2018b). Consider what Owen et. al. (2013: 32) write about this:

> [I]nnovation is a process of imagination, invention, and development that *actively seeks* novelty, with the creation of value as its goal. Here, by definition, regulatory forms of governance and control may not exist, or are unclear in terms of their coverage . . . : knowledge of the social norms against which transgression can be judged may also be poorly defined, unclear, or contested.

Shannon Vallor refers to our "*acute technosocial opacity*" (2016: 6): It is typically very challenging to foresee in detail the consequences of future innovations or to envision moral duties needed for future innovations. Vallor, therefore, advocates using virtue ethics as a framework for the development and deployment of technologies (as an alternative or supplement to consequentialism or deontology), especially for *emerging* technologies—technologies that are being developed—and that enable new forms of conduct and will impact human values and society at large.

Virtues are understood as dispositions, which people can cultivate through exercise (Rachels 1993: 216, Urmson 1999: 130, Van Tongeren 2020). One can cultivate a virtue like courage by training and exercising courage in practice and learning from that. At first, this requires effort to, thereby, gain experience. It may feel awkward or it may lead to not entirely courageous behaviour, but over time, one will learn how to align one's thinking, one's feeling and one's actions. This is the process of cultivating a virtue. If a virtue requires extensive thinking, feels awkward, or is only partly successful, the agent may very well be in the process of cultivating a specific virtue. A person who has cultivated a specific virtue will exercise this virtue naturally, *out of habit* as it were, at the right moment, in an optimal form, for the right reasons and with appropriate feelings.

Three further aspects of virtue ethics need to be clarified. As virtues reside *in an agent* and as many virtues—depending on the situation—benefit the agent, e.g., if you are courageously standing up against an oppressor, you benefit from this (Foot 1978: 3), one might think of virtue ethics as a theory akin to ethical egoism. However, the distinction between purely self- and other-regarding ethical theories is a modern one and can only artificially be imposed on pre-modern theories such as Aristotle's. For him, the virtues identify people as noble or admirable. These notions likely implied that their actions are both beneficial to themselves and their community: The virtues are meant to contribute to living together in a *polis*—in a society; we are *zoon politikon*, social animals. This is in line with our understanding of virtue ethics in the context of RI: The individual innovator will need to cultivate relevant virtues in order to be able to fulfil her role in the process of RI, which aims to contribute to solving problems in society or promoting people's wellbeing.

Another point refers to the *mean* and to the relationship between virtues and vices. Each person needs to find the *mean* for each virtue in each situation—in between the vice of deficiency and the vice of excess. If we take the example of courage again, we can imagine a situation in which you see a person being attacked on the street. If you are a frail person, it would be courageous to stay out of the conflict and phone the emergency number; it would be reckless to intervene in the fight. Alternatively, if you are an athletic person, active intervention would be courageous; it would be cowardly to stay out of the conflict. Depending on individual abilities and contextual conditions, people in different situations need to determine the appropriate expression of courage.

Thirdly, it is key to understand that the ultimate end (*telos*) of cultivating virtues is to live a good life (*eudaimonia*); both in terms of one's own flourishing, the alignment of one's thinking, feeling and acting, and in terms of contributing to creating a society in which everyone has the opportunity to flourish.

Unlike other normative ethical theories, which aim at steering behaviour by answering what ought to be done, virtue ethics is concerned with analysing and narrating exemplary characters and lives (Nussbaum 1991; Zagzebski 2006; 2010). One can understand virtue ethics as a *map*, which can help to orient oneself in relation to a specific situation and to find one's own way, during the innovation journey (Rip 2012), depending on the situation. It is very different from a road sign, which prescribes specific behaviour or points in one specific direction. A map depicts one's surroundings and can serve as a guide; it can also spark one's curiosity about other locations, promote one's moral imagination. Moreover, a map can depict exemplars, people who embody or exemplify

specific virtues and who are seen as admirable (Zagzebski 2010: 44), e.g., in public discourse. One can look at these exemplars and be inspired to further cultivate specific virtues. We will outline later on, that in this way virtue ethics is not only an academic tool for position-fixing, but more generally a practically relevant device for moral education. Instead of being restrictive, virtue ethics is directive and instructive: It does not state "You should *not* . . . ," but instead helps to guide one's natural motivations and impulses to do good. It approves that reformation and internalization are protracted processes. Furthermore, virtue ethics can easily connect to the practice of innovation (and other fields), because it acknowledges the complexities and specificities of each individual, their capacities and background. Thus, it speaks to professionals.

It is, therefore, no wonder that virtue ethics is increasingly seen as a suitable framework for professionals. It provides an aspirational framework of cultivating specific virtues that contribute to one's professional role—in our case: to work in RI. There is a growing interest in virtue ethics in journals like the *Journal of Business Ethics* (Whetstone 2001, Bastons 2008, Bertland 2009, McPherson 2013, Wang et al. 2016, Grant et al. 2018, Sand 2018b, Steyn and Sewchurran 2019) and *Science and Engineering Ethics* (Pritchard 2001, Crawford-Brown 1997, Harris 2008, Frey 2010, Stovall 2011, Steen 2013, Schmidt 2014, Chen 2015, Han 2015, Pennock and O'Rourke 2017). Thus, there is a strong case to advocate virtue ethics as an accomplice for RI. Before turning to a concern about the *mean* in virtue ethics and the prima facie tension between responsibility and innovation, we will further this cause by considering which virtues are most relevant in RI.

4. Virtues in Responsible Innovation

Below, we present and discuss two clusters of virtues that people who are involved in RI would need to cultivate.[4] The first cluster of virtues is associated with the *Responsible*-side of RI, whereas the second is associated with the *Innovation*-side of RI. This overview is based on a review of relevant literature, e.g., of articles that appeared in the *Journal of Business Ethics* (Whetstone 2001, Bastons 2008, Bertland 2009, McPherson 2013, Wang et al. 2016, Grant et al. 2018, Sand 2018b, Steyn and Sewchurran 2019), the *Journal of Responsible Innovation* (Nordmann 2014, Di Giulio et al. 2016, Pellé 2016, Bergen 2017, Reber 2018) and in *Science and Engineering Ethics* (Pritchard 2001, Crawford-Brown 1997, Harris 2008, Frey 2010, Stovall 2011, Steen 2013, Schmidt 2014, Chen 2015, Han 2015, Pennock and O'Rourke 2017). Our overview resembles Vallor's (2016) list of "technomoral" virtues—virtues that people (in

general) need to cultivate in order to flourish in the twenty-first century: honesty, self-control, humility, justice, courage, empathy, care, civility, flexibility, perspective, magnanimity and wisdom.[5] However, our list is different in that it focuses specifically on virtues that people need to cultivate in their role of researcher, designer or developer in the domain of RI.

We also found relevant articles in the present journal, e.g., on courage (Harris 1999), love (Harris 2002), inquisitiveness (Harris 2011), on combining Aristotelian and Confucian virtue traditions (Hackett and Wang 2012, Shen-bai 2017), and on virtues that promote ethical corporate leadership (Klein 1995), servant leadership (Lanctot and Irving 2010), sustainability (Blok et al. 2015), and working towards public interests (Stelios 2020).

People in RI need a range of virtues that are oriented towards the *responsible*-side of RI include, for example:

- *justice*, one of the four classical, cardinal virtues, for which Vallor provides an update for the context of developing and using technologies: a "*reliable disposition to seek a fair and equitable distribution of the benefits and risks*" and a "*characteristic concern for how . . . technologies impact the basic rights, dignity, or welfare of individuals and groups*" (Vallor 2016: 128);
- *anticipation*, one of the four key dimensions of RI (Stilgoe et al. 2013, Nordmann 2014), i.e., an early assessment of a project's potential impacts, especially its unintended or unwanted impacts; *or precaution* (Reber 2018), e.g., as understood by Hans Jonas in his book *Imperative of Responsibility* (1984);
- *perspective*, "a reliable disposition to *attend to, discern, and understand moral phenomena as meaningful parts of a moral whole*" (Vallor 2016: 149), or "technosocial sensitivity" and "awareness of the social context" (Harris 2008);
- *humility*, "*a recognition of the real limits of our technosocial knowledge and ability*" (Vallor 2016: 126);
- *honesty* (Vallor 2016, Pritchard 2001), "*an exemplary respect for truth, along with the practical expertise to express that respect appropriately in technomoral contexts*" (Vallor 2016: 122), or the "formation of justified belief" (Crawford-Brown 1997);
- *civility*, "*a sincere disposition to live well with one's fellow citizens . . . : to collectively and wisely deliberate about matters of local, national, and global policy and political action; . . . and to work cooperatively toward [the common good]*" (Vallor 2016: 141), or *civic-mindedness* (Pritchard

2001), "devotion to service" (Crawford-Brown 1997), "commitment to the public good" and "respect for nature" (Harris 2008);

- *inclusion* and *responsiveness*, key dimensions of RI (Stilgoe et al. 2013, Di Giulio et al. 2016), as in: *a concern for promoting and organizing inclusive, deliberative processes* (Reber 2018), e.g., via societal engagement and stakeholder involvement; and, similarly, *a concern for promoting diversity*, e.g., in terms of gender or culture in the members of the project team; and
- *compassion*, *empathy* and *care* (Vallor 2016). Vallor distinguishes between empathy, a "*cultivated openness to being morally moved to caring action by the emotions of [others]*" (2016: 133) and *care*, "*a skilful, attentive, responsible, and emotionally responsive disposition to personally meet the needs of [others]*" (2016: 138). In other words, *care* happens between care-giver and cared-for, and can be absent in an RI project, whereas *empathy* would be needed in an RI project, e.g., between project team members and prospective users or putative beneficiaries.

Being attentive and cautious about the effects of one's actions in an increasingly complex world in which diverse phenomena are related—e.g., one's consumption of animal-based food, CO2 emissions, climate change, international conflicts and refugees—is a crucial disposition. "Under such responsibility, *caution*, otherwise a peripheral matter, becomes the core of moral action," writes Hans Jonas (1984: 38). A *deficiency* of these virtues would be thoughtless or careless, whereas an *excess* would be an overly cautious or small-minded—which would hinder progress and delivering results. To further provide a realistic and graphic idea of how virtues might play out in practice, we utilize a vignette, a short description of a person, who embodies a set of virtues.

One can imagine Rachel, a physicist working in a project that aims to accelerate the transition to sustainable energy. She stresses justice in the sense of making these solutions available to and affordable for different groups of people. She is keen to identify and explore potential adverse effects of the innovation they are working on, in order to mitigate these. Furthermore, she advocates organizing roundtable sessions to involve citizens—the putative beneficiaries of their project, in order to learn their needs and preferences, so they can cater to these more optimally. Moreover, her disposition is one of compassion and care, both within the project team, and in her putting forward of a vision for a society worth wanting.

Furthermore, people in RI need a range of virtues that are oriented towards the *innovation-side* of RI, for example:

- *courage* (Harris 1999, Pritchard 2001), one of the four classical, cardinal virtues, which Vallor defines as "a reliable disposition toward intelligent fear and hope with respect to moral and material dangers and opportunities" (Vallor 2016: 131), or courage as the right balance between fear and *confidence*, where the latter is related to one's beliefs about oneself, rather than to the future in general (which is hope) (Roberts 1989);
- *self-control*, or prudence, another classical, cardinal virtue: one's ability to govern, regulate and discipline oneself; or "exercises of the will" (Crawford-Brown 1997);
- *dedication*, *commitment* (Sand 2018b), or perseverance (King 2014), a disposition to keep on working on a project and putting in effort, despite difficulties or adversity;
- *vocation*, *calling* (McPherson 2013), or *passion* (Isaacson 2011: 567), a disposition to view one's work or project as meaningful and worthwhile, both personally and for some greater good;
- *curiosity* (Baumgarten 2001, Whitcomb 2010) or inquisitiveness (Watson 2014, Harris 2011), which, in the context of collaborative innovation, can be understood as "a disposition of being open and receptive towards other people and their experiences, and towards one's own experiences and learning" (Steen 2013);
- *creativity* (Martin 2006, 2007), which, in the context of collaborative innovation, can be understood as "a disposition of jointly generating ideas, combining ideas of different people, and of practically realizing ('making real') products or services" (Steen 2013), or "being imaginative" (Pritchard 2001);
- *flexibility*, which Vallor defines as a "*disposition to modulate action, belief, and feeling as called for by novel, unpredictable, frustrating, or unstable technosocial conditions*" (2016: 145); and
- *collaboration or cooperation*, a "disposition to promote cooperation and to foster a climate that promotes cooperation" (Steen 2013), *cooperativeness* (Pritchard 2001) and "conduct of dialogue" (Crawford-Brown 1997).

Working on innovation typically requires courage, dedication and commitment to overcome resistance to novel ideas or ways of working, which is likely to arise, especially when the innovation aims to break new ground and shatter established ways of living and working (Sand 2018b). A deficiency of these virtues may lead to inactivity, resignation or half-hearted attempts, whereas an excess may lead to recklessness, obstinacy or stubbornness. Deficiencies or excesses

of curiosity or of creativity may lead to imperviousness or apathy, obsession or self-absorption, disconnectedness or passivity, obsession or self-centredness (Steen 2013). Moreover, people involved in RI will need virtues related to *cooperation* because RI cannot be done by one individual but always requires teamwork (von Schomberg 2013). The virtue of cooperation refers not only to a person's efforts to collaborate with others, but also—and more importantly—to this person's efforts to promote collaboration (Steen 2013). The need for collaboration also emphasized in Open Innovation (Chesbrough et al. 2006) and Innovation Eco-systems (Autio and Thomas 2014).

One can imagine Ian, a computer scientist, working in a project that aims to establish guidelines to improve the transparency of algorithms that are used by various governmental agencies. He proposed the project—a brave move, out of his comfort zone of coding, into the domain of policy making. He is aware of his exercise of self-control, e.g., when he strives towards simplicity and refrains from adding unnecessary features. He is very dedicated to the project—which can be overwhelming to his fellow project team members. He collaborates with people with diverse backgrounds and roles—which requires his sustained curiosity and creativity; asking questions, being open to new perspectives, allowing periods of uncertainty.

5. The Doctrine of the Mean and Practical Wisdom (Phronesis)

The previous section discussed several virtues that people who work in RI projects need to cultivate. However, we did not yet answer our main question, which was: How can virtue ethics help to harmonize the seemingly incompatible demands for responsibility and innovativeness in Responsible Innovation? In this section, we will consider Aristotle's doctrine of the mean and whether it is helpful in addressing this question. We will argue that to balance the various virtues in the appropriate way, and to find the mean appropriate to a specific situation, innovators need to cultivate practical wisdom, or phronesis, as Aristotle called it (cf. Steyn and Sewchurran 2019).[6]

Let us start with the doctrine of the mean. Aristotle's doctrine of the mean holds that all virtues somehow represent a *mean* between two vices, which refer to either too little or too much of a certain tendency. Contained in Aristotle's doctrine of the mean is the assumption that not one but two vices correspond to each virtue (Young 1996). This is not uncontroversial, as one might also believe that with each virtue only one vice (the absence of the virtue) or various vices correspond (cf. Hursthouse 1980). But, let us assume for the sake of argument

that the doctrine of the mean is roughly adequate, how might it help to balance the various virtues in RI?

Take for example the virtue *courage*. Courage is a virtue that supports finding an appropriate balance between fear and hope—to face a dangerous or risky situation and act appropriately. Courage will be expressed differently, depending on the specific situation and on the specific people involved. A soldier in the frontline faces a dangerous situation and charges forward. A firefighter runs into a burning house to rescue another person. A doctor needs courage to perform a risky surgery. A nurse needs courage in her conduct towards a patient in a desperate situation. What these situations share, is that the agents involved shall find the appropriate balance between fear and hope and not slide towards the deficiency of cowardice or the excess of recklessness. The latter extremes, the deficiency or the excess of a virtue, can be understood as a vice.

Here, we need to clarify that the *mean* is *not* an arithmetical middle between the extremes of deficiency or excess, e.g., courage is not necessarily exactly in the middle between cowardice and recklessness. Similarly, the *mean* does *not* refer to a specific *amount* of courage. Rather, the *mean* refers to an optimal form or expression of a specific virtue, appropriate for that specific situation. The courage of a researcher or developer involved in a RI project will find a different expression than the courage of a soldier or firefighter, and from the courage of a doctor or nurse; it will be articulated, e.g., in speaking up about a unjust situation that may result from the innovation they are working on, in putting forward a critical view on the project on behalf of a specific group in society, or, in a more extreme example, in blowing the whistle about immoral behaviour in the project.

There are, however, two problems with using the doctrine of the mean to answer our main question. The first is that our question is not about how to find the mean for one specific virtue, but rather about combining a range of virtues. One might assume that if we find the right mean for each virtue, we have also found the overall right balance. However, it would seem more likely that a specific situation will call for a limited set of virtues. Looking at the tension between virtues associated with the *Responsible*-side of RI and virtues associated with the *Innovation*-side of RI, a person working in RI needs to combine different virtues in different situations. Some virtues blend well, like justice and civility (although this may prove hard in practice) or inclusion and cooperation, whereas other virtues are hard to harmonize, like caution (risk aversion) *and* curiosity (which may be associated with taking the risk of venturing into the unknown), or dedication (which appears rigorous) *and* flexibility. The question then seems to be twofold: How can a person involved in RI identify what virtues (from the list in

the previous section) are relevant in a specific situation, and how to balance these virtues? The doctrine of the mean can, at best, solve only the second problem.

This brings us to another issue: The doctrine of the mean does not tell us, where the mean can be located, it merely suggests that such a mean exists. This is indeed recognized by Aristotle (e.g., *Ethica Nicomachea* VI, 1, 1138b). The doctrine of the mean, thus, does not tell in a practical sense what the right amount of each virtue is, let alone how to recognize the relevant virtues in a specific situation and how to balance them. The answer to these questions must, therefore, not be sought in the doctrine of the mean but in another virtue, which functions as a regulator of the other virtues, i.e., the virtue of practical wisdom or *phronesis*. Because practical wisdom regulates the exercise and cultivation of other virtues, it is a key virtue (see also: Bachmann et al. 2018, Steyl 2018). Christine Swanton suggests in this vein that "Aristotle (rightly) regards practical wisdom as the glue which not only integrates the components of the profiles of the individual virtues, but also unites those virtues one to another." (Swanton 2003: 27)

In Aristotle's practical philosophy, the virtue of *phronesis* differs from the moral virtues we have discussed in the previous section in a number of respects. First, Aristotle characterizes it primarily as an intellectual rather than a moral virtue. But, what is perhaps more important, he believes that *phronesis* concerns the good in general: It concerns what to do, all things considered, rather than from a specific perspective, e.g., the perspective of bodily health or the perspective of social justice. This makes it a particularly relevant virtue for our quest. *Phronesis* is not about *which* virtues are needed, but rather about what is admirable behaviour from an all-things-considered point of view; a view, moreover, that is highly relevant in the present context as it integrates the antagonistic demands of being responsible and of being innovative.

A third characteristic of *phronesis*, according to Aristotle, is that it cannot err, if properly exercised. This sets *phronesis* apart from the other virtues, with which one can err, towards excess or towards deficiency. In other words: the doctrine of the mean does not apply to *phronesis*. One needs to *cultivate phronesis*, so that it can guide the other virtues. Cultivating *phronesis*, like the other virtues, cannot be done by reading books, but needs to happen in practice, through action, by making mistakes and learning from these.

The virtue of practical wisdom then seems capable to fulfil all the necessary functions we identified above for answering our research question. First, it can help to judge what virtues (from our list) are relevant in a specific situation. Second, it will help to find the right mean for each of these virtues and, third, it

will help to balance the possible tension between being responsible and being innovative from an all things considered perspective. See Figure 1.

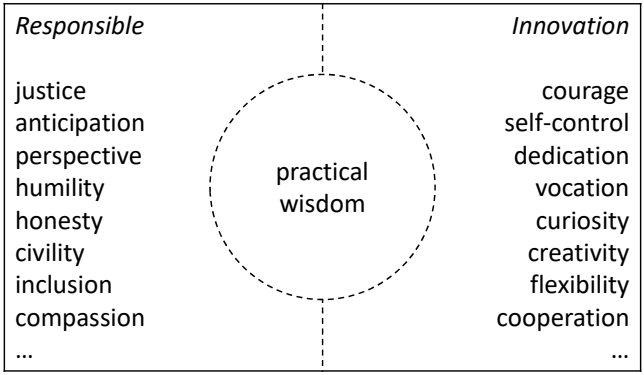

Figure 1: People involved in Responsible Innovation will need to cultivate two clusters of virtues, plus the virtue of practical wisdom, to regulate the exercise and expression of the other virtues.

Of course, what has been presented is a theoretical argument in defence of the view that practical wisdom can fulfil these roles and, thereby, harmonize the seemingly incompatible demands for responsibility and innovativeness in RI. The arguments do not inform us, how to acquire practical wisdom.

Before summarizing our results, we shall briefly elaborate in the following, how the virtue of practical wisdom can be related to other virtues in RI. We associate practical wisdom with *reflexivity* (Stilgoe et al. 2013, Steen 2013), *responsiveness*, the organizing of "iterative, inclusive, and open processes of adaptive learning, with dynamic capability" (Stilgoe et al., 2013) or *self-awareness*: "a sort of master virtue that fosters the reflective deliberation necessary for a professional to pursue their work in an aspirational frame of mind" (Stovall 2011).

In the context of RI, practical wisdom will point towards anticipation, responsiveness, inclusion and reflexivity (key dimensions of RI); towards *collective* goods (rather than *only* individual goods) and towards longer-term goals (rather than short-term goals), like sustainability, and towards virtues that we associate with RI, like the following:

- *magnanimity* (Vallor 2016), which refers to a disposition that enables and encourages moral ambition and moral leadership (152) and a "willingness to make self-sacrifice" (Pritchard 2001);
- *generosity*, a disposition to "make the world a better place" (Shapin 2008: 312), to promote public interests (Stelios 2020);

- and *empowerment*, "a disposition and a willingness to share power with others, especially with prospective 'users,' and to 'let go of control'" (Steen 2013) or servant leadership (Lanctot and Irving 2010).

These additional virtues remind us of the importance of contributing to a greater good in RI. This is not meant to set up RI in opposition to making financial profits. Rather, RI can be conducive to having and maintaining long-term success.

Finally, the regulative function of practical wisdom should be underscored. This regulative function, of combining, exercising and cultivating other virtues in an appropriate balance, may help an individual to find the right balance between some other virtues. However, it will often be impossible to balance and exercise *all* the virtues *at the same time*, *all* the time. Individuals need to exercise different virtues in the course of time, e.g., first self-control, then curiosity, then justice, then creativity. Since RI (or innovation more generally) involves teamwork and collaboration, she can also turn to co-workers in her project (multidisciplinary teamwork), or engage people outside the project (societal engagement); these people typically have other skills, knowledge, and will be able to exercise other complementing virtues. Practical wisdom suggests other ways of regulating the various relevant virtues in such situations. Think for example of the following possibilities:

- Within one person: Rachel may express the virtue of justice at the start of a specific project meeting, to draw a larger picture of potential adverse effects of the project, and she may express the virtue of civility later on in the same meeting, in a proposal to involve stakeholders in their project, e.g., by organizing round-table workshops.
- Within the project team: Anne and Baz collaborate in a project that aims to reduce energy consumption and hothouse gas emissions. They complement one other in the sense that Anne is especially good at anticipation, e.g., identifying potential problems, whereas Baz is especially creative, e.g., envisioning potential solutions.
- Within the project, e.g., in different stages: Iain has expressed courage in proposing the project and in dedicating himself to it—which was very much needed to get the project started. Near the end of the project, however, virtues like care and flexibility are needed—virtues that other project team members are able to put into the mix.

These examples illustrate how one person can choose to express different virtues at different moments, depending on time and context, e.g., other people's virtues.[7] It does not yet clarify which virtues one person may need to select in

which situation. It is assumed that *phronesis* takes care of that; to choose wisely which virtues to express, and to express these in their appropriate form. However, people may want to experiment with reflexivity in order to find out *how* they choose which virtues to bring to the fore in specific situations, and how they alternate between virtues depending on time and context.

Questions about the selection of different virtues could also be a topic for further study.

In many of these examples, *collaboration* is critical. It would, therefore, be good, if one (or more) of the people involved cultivate the virtue of collaboration. Moreover, *all* people involved will need to cultivate practical wisdom to exercise their virtues, to collaborate and to, thereby, affect the exercise of virtues of other collaborating individuals.

6. Conclusions and Outlook

We have discussed the need for people who work in Responsible Innovation (RI) to cultivate a range of virtues related to the *Responsible*-side of RI, such as e.g., justice, anticipation, civility and inclusion, and a range of virtues related to the *Innovation*-side of RI, such as courage, dedication, curiosity and creativity. Finally, we have presented an in-depth discussion of practical wisdom (*phronesis*) and outlined its role as a *master* virtue. The latter supports steering the exercise of other virtues, which involves the alignment of one's thinking, one's feeling and one's actions, in order to find the appropriate *mean* for each virtue—which will vary from person to person and context to context.

Virtue ethics is clearly not a panacea that can guarantee the emergence of socially beneficial innovation. However, for reasons outlined before, it is a useful ethical theory that shall be complemented by other approaches focussing on governance (Voegtlin and Scherer 2017), for instance, in the case of RI in the domain of Artificial Intelligence: *legislation and policies*, such as the European Commission's *High Level Expert Group for Artificial Intelligence*, or *standards and codes of conduct* of professional organizations, such as the IEEE's standards for *Ethically Aligned Design: A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems*.

That virtue ethics is not a panacea, does not undermine its value as a tool for normative navigation. Consider—utilizing the previously introduced analogy—that using a map is equally insufficient to arrive at a specific destination: You may get lost, despite using the map and you might find your destination without the map purely by accident. Clearly, however, a map will increase your

chances of finding your way. In the same way, innovating virtuously increases the chances to successfully bring about innovations that are conducive to society.

We suggested before that virtue ethics is also an attractive educational framework. When considering the analogy with a map again (see Zagzebski 2010), some reasons for this come more strongly to the fore: First, virtue ethics allows for a great deal of autonomy of the learning subject, it accepts failure and allows for growth over time. Unlike some paradigmatic thought experiments in applied ethics, the real world often provides more than just one or two choices for action. In this way, a map—just like virtue ethics—supports individuals to figure out, which pathway towards a certain goal suits best. Furthermore, like any map, which must have some relation to the landscape it is representing, virtue ethics sets out with reference to objects to which people already feel attracted.

It does not overcome people and force them to change their normative convictions and behaviour: Instead, it starts from the descriptive fact that there are people—positive *exemplars*—to whom we feel drawn and whom we admire for whatever traits they display. Virtue ethics capitalizes on such pre-existing emotions of admiration that are often accompanied with the motivation to imitate the person one admires. What is, however, often lacking is a clearer understanding, which feature exactly it is that one admires in this or that person, and how one could successfully aspire to adapt such feature or internalize such intent. Teaching virtue ethics helps with both of these tasks. Consider the vignettes that have been presented in section 3: Such vignettes give a more graphic display of the virtues in action and spark the imagination. In discussing such fictitious or real-life cases (Sand 2018a), virtue ethics provides the opportunity to connect one's own professional situations to these cases and to figuring out individually suitable ways of following the footsteps of those exemplars.

In the field of RI, there are clearly many existing examples that spark admiration and recognition. For example, in the domain of Artificial Intelligence, one can think of social entrepreneurs like Cathy O'Neil, author of *Weapons of Math Destruction* (2016) and consultant in *Risk Consulting & Algorithmic Auditing*, or Virginia Dignum, Amy van Wynsberghe and Catelijne Muller, who collaborate as academics with policy makers, industries and social entrepreneurs.[8] In the domain of sustainable development, one can think of Kate Raworth, advocate of *Doughnut Economics* (2018), or Otto Scharmer, advocate of *Theory U* (2018). Both frameworks for sustainable development have inspired and empowered thousands of people in industries and governments. Historical exemplars could include, e.g., Marie Skłodowska-Curie (born in 1903), pioneer not only in the discovery of x-rays, but also in their practical application in medicine,

e.g., by helping to create portable x-ray machines, or Stephanie Kwolek (born 1923), who developed polymer fibres for extreme performance, which was later advanced and used in Kevlar—a material that is used in body armour for policemen and soldiers and has saved countless lives.

Virtue ethics can thus embolden and promote RI by helping to identify relevant exemplars, providing analyses of their lives and actions, supporting "reflective admiration" (Zagzebski 2013), and inspiring people who work in RI to cultivate and exercise relevant virtues.

Notes

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1. We use the term "Responsible Innovation" rather than "Responsible Research and Innovation" because we focus on innovation, rather than on research. Furthermore, there are clear overlaps with Corporate Social Responsibility (CSR); insights from both frameworks can be fruitfully intertwined (Van de Poel et al. 2017).

2. See, e.g., https://ec.europa.eu/research/swafs/pdf/pub_rri/KI0214595ENC.pdf.

3. In accordance with, e.g., Uhl-Bien 2006, we see our focus on individuals to be non-exclusive with leadership theories that are focussed on relations; these views might be considered as different sides of the same coin.

4. Our list of virtues is most likely incomplete and might appear ad hoc: This, as we contend, has the benefit of allowing for alterations to accommodate changes in the field of RI, which will affect our understanding of virtuous behaviour in those fields. Following Zagzebski (2006, 2010, 2013), our list is empirically informed by a body of literature on the lives and works of admirable people (e.g., Csikszentmihályi 2004, Isaacson 2014)—admirable in the context of Responsible Innovation. Together with our review of literature on virtue ethics in business ethics and in engineering ethics, we identified common overlaps and congruencies. The resulting list can be considered synthetic-a-priori: it is empirically informed and homes in on commonalities and congruencies of accounts on virtue ethics, overlaps in character

traits of famous innovators and our understanding of RI, which makes it sufficiently robust for our current purpose.

5. Shannon Vallor's (2016) list of virtues refers primarily, so it seems, to people in their role of citizen, user or customer—although, of course, many of the virtues she discusses are equally relevant to people who work in RI. Hence, there are overlaps between her list and ours.

6. A rather different way of relating responsibility and innovation within Emmanuel Levinas's phenomenology is proposed by Jan Bergen (2017).

7. Aristotle's account, on which we heavily draw here, is primarily conceptual: it suggests, how phronesis would function in general; it does unfortunately not offer a way to operationalize or test its working effectivity. An empirical investigation into its effectivity seems hampered as the right exercise of phronesis always lead to an expression or realisation of the right virtues to their right degree. But, the reverse does not hold true: the right exercise of virtues is not necessarily guarantee that an agent has made proper use of phronesis. Only the latter is observationally accessible and doesn't would allow us to draw inferences about the proper exercise of phronesis as a meta-virtue.

8. For example, through their roles as members of the European Commission's High Level Expert Group on Artificial Intelligence and the Alliance on Artificial Intelligence (ALLAI; http://allai.nl), which they founded.

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