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Emotions, values and technology: illuminating the blind spots

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ABSTRACT

Responsible innovation and ethics of technology increasingly take emotions into consideration. Yet, there are still some crucial aspects of emotions that have not been addressed in the literature. In order to close this gap, we introduce these neglected aspects and discusses their theoretical and practical implications. We will zoom in on the following aspects: emotional recalcitrance, affective forecasting, mixed emotions, and collective emotions. Taking these aspects into account will provide a more fine-grained view of emotions that will help to improve current and future approaches and procedures that incorporate emotions.

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Introduction

Technology can support or infringe on values (van den Hoven, Vermaas, and van de Poel 2015). Because emotions are intimately tied to values (Montague 2009; Roeser and Todd 2014; Teroni 2007), scholars in ethics of technology, responsible innovation, and Science and Technology Studies are increasingly interested in emotions. Some even propose that emotions can and should play an important role in deliberation, technology assessment and responsible innovation (Desmet and Roeser 2015; Roeser and Pesch 2016). Yet, there are still some crucial aspects of emotions that have not been addressed in the literature. In order to close this gap, we introduce these neglected aspects and discuss their theoretical and practical implications. Specifically, we will zoom in on the following aspects: emotional recalcitrance, affective forecasting, mixed emotions, and collective emotions. Furthermore, we will introduce the issue of fittingness as overarching analytical perspective that is helpful in making sense of these neglected issues. Taking these aspects into account will provide a more fine-grained view of emotions that will help to improve current and future approaches and procedures that incorporate emotions.

We start by briefly outlining some of the approaches in the fields of ethics, responsible innovation (RI) and Science and Technology Studies (STS) that take emotions into account or put them to heuristic use. After that, we will zoom in on the five crucial but overlooked aspects of emotions.

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A brief clarification regarding emotions: Emotions can be characterized by a combination of features. Emotions are mental states and as such intentional. That is, they are directed at an object (e.g. person, event). For instance, you can be disappointed in somebody and angry with someone/something. Emotions also involve an appraisal, that is something is evaluated in a specific way (It is subject to debate whether the appraisal is a constitutive part or precedes the emotion, see (Mulligan and Scherer 2012)). The appraisal aspect links emotions to what people care about. Some have proposed that emotions are concern-based construals (Roberts 2003). People have different concerns. For instance, they value their safety, are attached to other people, and have certain interest in things. Given these attachments and interests (concerns), emotions make an object or situation appear in a certain way. Appraisal is linked to another important feature of emotions: motivational action-tendencies (Frijda 1986). When we care about something, we are motivated to pursue goals that are in line with our concerns. For instance, when someone fears for the life of their child, it involves a tendency to protect it or avoid danger. Emotions have a certain phenomenology. It feels a certain way to be fearful that is distinct from how it feels to be sad. Although the terms 'emotion' and 'feeling' are often used as synonyms, it is important to keep feelings and emotions separate because there are plenty of feelings of bodily changes that are non-emotional. For instance, feelings of hunger or arousal reflect bodily changes or states. Emotions usually involve feelings, for instance when you can feel your heart race in a dangerous situation or the feeling of pleasure, but go beyond these feelings because of the aforementioned appraisals. There are other affective states besides emotions, moods for instance. Although moods share some features with emotions, there are crucial differences. For example, unlike emotions, moods are not directed at concrete objects. As we will make clearer later on, emotions cannot be fully understood without considering the social and cultural context.

Emotion-friendly approaches

There is a growing interest in emotions within the fields of ethics of technology, responsible innovation and STS. Some STS publications look at history and how past discourses about media technologies still inform our thinking about the link between emotions and novel media technologies today (Malin 2014). STS scholars also stress that social, political and cultural processes play a role in the constitution of emotion and risk. Both the judgment of risk and emotion are in flux and not confined to the individual (Lupton 2013). Furthermore, some STS scholars stress that emotions are a crucial element of public engagement, deliberation and science communication (Davies 2014, 2019).

Another crucial focus in STS is the co-production of science, ethics and emotions (Pickersgill 2012). Scholars have explored the role of affective practices for the production of scientific knowledge and how affective practices are constituted by material practices in laboratories (Kerr and Garforth 2016). An increasing number of publications looks into the role of emotions in clinical settings. For instance, the way that fear and anxiety influences both people's experience of dementia diagnosis and how dementia is diagnosed and assessed (Swallow and Hillman 2019). Authors have also highlighted the role of emotions in generating and sustaining knowledge regarding autism in neuroscientific practice (Fitzgerald 2013).

Focusing on technology instead of science, researchers have examined 'networked affects', which means affective experiences and emotions related to online technology

and social media (Hillis, Paasonen, and Petit 2015). Recently, some scholars explored emotions in digital STS research and extended Latour's actor-network theory to include so-called emotive actants (Stark 2019). Others propose an affective actor-network theory to make better sense of the proliferation of novel technologies and the way that affects (re)constitute technologies (Sage, Vitry, and Dainty 2019).

Responsible innovation researchers have looked at the role of emotions in research collaborations, addressing issues like disciplining emotions and the impact of particular emotions in large research projects (Griffin, Bränström Öhman, and Kalman 2013). Authors also stressed the interplay of emotional, cognitive and interactional components for scientific collaboration (Parker and Hackett 2012) and for successful interdisciplinary research collaborations (Boix Mansilla, Lamont, and Sato 2016). Researchers also highlight the affective dimension of responsible innovation processes. For instance, Hammershøj (Hammershøj 2018) claims that the processes of both creativity and innovation are based on emotions, and that leaders and teams need to be sensitive to the constructive and destructive potential of these emotions.

The values that people hold predict emotional responses to technologies (Perlaviciute et al. 2018) and ethicists have argued that emotions are an important gateway to values and moral considerations regarding technologies (Roeser 2018). Explicitly highlighting the constructive role of emotions, the emotional deliberation approach (Roeser and Pesch 2016) proposes to integrate emotions in deliberation, participatory procedures and political decision-making. Furthermore, because emotions are linked to personal and moral values, authors have called for an inclusion of emotions in value sensitive design and design for values (Desmet and Roeser 2015).

Emotions and technology: some neglected issues

The goal of this paper is to complement the existing approaches that take emotions seriously by drawing attention to some overlooked aspects of emotions. In the following sections we will introduce and discuss these aspects: recalcitrance of emotions, affective forecasting, mixed emotions, and collective emotions.

However, before we examine these neglected issues, we will first introduce another crucial theme. Scholars that want to utilize or incorporate emotions in their approach should acknowledge that emotions can be fitting or unfitting. Addressing this theme will yield a more sophisticated and nuanced understanding of the possibly constructive as well as undesirable role of emotions.

Overarching theme: fittingness of emotions

Emotions are intentional states, that means an emotion is about something. Another way of putting this is to say that an emotion is directed at an object beyond itself. The intentionality of emotions is usually expressed in phrases like 'angry *at*' or 'jealous *of*'. People can be angry at or jealous of a variety of things or people, whereas they experience the same type of emotions, namely anger or jealousy. To make sense of this flexibility and yet sameness of emotions, philosophers of emotions sometimes distinguish between the particular and formal object of an emotion. Instances of an emotion type (e.g. anger, fear, pride) can have different particular objects while all the instances of an emotion type have the same

formal object (or 'core relational theme', see (Lazarus 1991)). For instance, we can be angry, joyful or sad about different things and events. These things are the particular objects of the emotion. However, whether you are angry with your partner, dog or computer (i.e. the *particular* object of your emotion), the *formal* object remains the same, namely something that is seen as offensive. The formal object *represents* entities as being this or that way. For instance, anger represents something *as offensive*. Likewise, in fear you will experience something *as dangerous*. Another way to express the idea of a formal object is to say that emotions *apprehend* objects in a specific evaluative light.

In a nutshell: Emotions are directed at a particular object (e.g. a matter of fact, person, or event) that is then appraised in a certain way (i.e. formal object). Because emotions are representational, they are able to *misrepresent*. In that sense, an emotion can be inaccurate or not fitting. Fear apprehends something as dangerous but that does not mean that whenever we experience fear that the object is in fact dangerous. Consider the following: Fear of a tiny dog does not *fit* the particular object, because the dog does not pose a real danger. The formal object not only functions to distinguish types of emotions but it is also the standard of fit for the token emotion of each type. To give another example here: The emotion of annoyance can be fitting or not. It is sensible to say that annoyance represents its object as having failed to exemplify a certain quality or excellence that is expected of it by the emoter (Roberts 2014). Hence, an episode of annoyance is fitting, when the target does not exemplify standards of excellence. Further, there are episodes where annoyance does not seem fitting, as when we hold something or someone to an unreasonably high standard or when we have too high expectations (Roberts 2014).

Fittingness should not be confused with appropriateness, although some authors use the terms interchangeably. Fittingness is related to the intentional structure of emotions as elucidated above, whereas appropriateness is tied to culture social context. Instead of discrete and isolated episodes in people's heads, emotions depend on interaction with others (Burkitt 2014) and there is a dynamic interplay between emotions and the social and cultural realm (Boiger and Mesquita 2012). There is cultural and social variability in emotion concepts, emotion categorization, and emotion experience (Barrett 2006), and emotions are partly determined by the sociocultural context (Mesquita and Boiger 2014). Culture, social practices and politics play a big role in the judgment of when it is (in)appropriate to experience and express an emotion (Shields 2005). So, there may not be an objective standard for when an emotion is appropriate.

Thinking of emotions as dynamic, relational and socially interactive processes also helps to illuminate where standards of appropriateness come from and how they are maintained. Standards are shaped by social practices. Social practices are linked to social norms, which are behavioral rules that are shared among members of a group and that prescribe or proscribe a certain conduct (Bicchieri and McNally 2018). Socially shared norms regarding which emotions and emotion expressions are appropriate or not, and who should have a particular emotion in a particular situation, have been called feeling rules (Hochschild 1979) or display rules (Ekman and Friesen 1975). These emotion norms can be considered a subset of social norms. Social norms are linked to expectations about how people, including oneself, act in certain situations (empirical expectation), and to expectations of how people should act (normative expectation) (Bicchieri 2005). Similarly, emotion norms are linked to expectations of how people (including oneself) will feel and should feel in certain situations. Standards and emotion norms are specific

for situations and can vary between contexts and social roles. A particular person, or group of persons, may be expected to have particular emotions in one context but not another. Like other social norms, emotion norms are learned through socialization and maintained through repetition, the wish for social conformity or the desire not to be sanctioned. Emotions themselves can also play a role in solidifying emotion norms. People may experience meta-emotions about having inappropriate emotions. For example, someone could feel guilty or ashamed about having a certain emotion. Because guilt and shame are something to be avoided, these meta-emotions motivate people to conform to prevalent emotion norms.

It is important to note that inappropriateness does not exclude fittingness. People usually can give reasons why an emotion is inappropriate or wrong – e.g. on moral or prudential grounds- but that does not mean that the emotion is unfitting. For instance, amusement may be morally inappropriate in a situation but that does not mean that the joke was not funny.

The above picture of emotions and their appropriateness and fittingness has implications for accounts that seek to elucidate the connection between emotions and technology and accounts that want to utilize emotions. We should take people's emotions seriously, because they *can* reflect moral considerations regarding technology. However, it also needs to be acknowledged that *not* every token of emotion that people experience regarding technology is fitting. For example, the emotion of fear regarding a technology may be not fitting because the particular object, in this case a technology, is apprehended as dangerous, when in fact it is perfectly safe. So, on the view regarding fittingness that we have outlined above, a technology may not merit a particular emotion. In this example, the technology in question does not infringe on a particular value, namely safety.

However, we would like to caution against being too quick to judge the fittingness of a particular emotion. An emotion may be considered not fitting when the focus is very limited, for instance on quantifiable risks. Yet, the emotion in question may not involve an incorrect mind-world relation of fit, like wrongly perceived quantitative aspects, but is grounded in other relevant evaluative considerations that get overlooked if the focus is exclusively on quantitative issues.

The issue of fittingness of emotions has repercussions for the acceptance and acceptability of a technology. Social acceptance needs to be distinguished from ethical acceptability (Taebi 2017). The first is about whether people actually accept and adopt a technology and the second is about the ethical reflection concerning the use and implementation of a technology. Emotions can and should be a source of insight when it comes to judging the moral acceptability of technological risks (Roeser 2010). Emotions are also crucial for the acceptance of innovation and technological risks. For example, anticipated emotions and emotional attachment to existing technology can impact the acceptance and adoption of new technology (Bettiga and Lamberti 2018; Read, Robertson, and McQuilken 2011).

Acceptability of a particular technology is a dynamic matter. Novel technologies and their implementation co-develop with the ethical deliberation and the social dialogue about it. Novel technologies are often controversial, politically contested and subject to ethical reinterpretation (Driessen and Korthals 2012). In the process of this contestation and reinterpretation, the standards of acceptability may change. Acceptability, then, should be looked at as a continuum and the degree of acceptability is subject to change (Wolfe et al. 2002).

Emotions, whether they are fitting or not, and considered appropriate or not, can have an influence on the production and change of acceptability. Both inappropriate and unfitting emotions can still be a gateway to people's values and their role for assessment of acceptability should not be dismissed. Inappropriate emotions, and unfitting ones for that matter, can also have a constructive function and contribute to social progress. For instance, experiencing an inappropriate emotion may incline some people to critically reflect on the underlying emotion norms and the reasons why they believe that having this emotion is not suitable. Because emotion norms are tied to social processes, the appropriateness of emotions can change. The critical potential of inappropriate emotions could contribute to the collective process of readjusting or abandoning emotion norms.[1]

So far, we have talked about technology without qualification. However, a distinction needs to be made between (i) characteristics of a technology as such, (ii) the use of the technology, and (iii) the characteristics of how the technology is implemented, like the decision-making process. Corresponding this distinction is the distinction between substantive and procedural values (Dignum et al. 2016). Substantive values refer to values of the technology and its effects, whereas procedural values pertain to the rules, regulations and the decision-making process regarding the technology, including issues of justice. Substantive values cover both (i) and (ii) because there are values, like aesthetic values, that pertain to the characteristics of technology but are not necessarily connected to how the technology is used. An example for (ii) and related substantive values is the positive or negative environmental effect that a technology has when it is used. An example for (iii) and connected procedural values is the question of whether the risks, benefits or costs of a technology are fairly or unfairly distributed. This is not about how technology operates or its effects but about social and political issues.

The upshot of this distinction is that it is not only the (i) characteristics of the technology and the (ii) use of the technology but also the (iii) implementation of the technology that may have negative or positive implications for values. Accordingly, emotions can be directed at either (i), (ii) and (iii), or combinations of two of these or all three together. This then also means that what we have said above about the (lack of) fit is applicable to (i), (ii), and (iii). It is possible that the implementation of the innovation does merit a particular emotion but other characteristics of the technology do not.

Thus far we have introduced recent advances in RI, STS and ethics of technology that highlight the role of emotions. We have also outlined the theme of fittingness of emotions and addressed issues of appropriateness. We will now introduce some aspects of emotions that have been overlooked in the literature.

Recalcitrance

The first aspect of emotions that has not received much attention is their potential recalcitrance. Usually, emotions dissipate once we learn that the world is not as the emotion apprehends it. For instance, anger regarding one person dissipates when someone learns that another person actually committed the offence. In cases of recalcitrance, the emotion persists despite contrary beliefs (Helm 2015). For instance, a person may be afraid of flying although she holds the belief that flying is perfectly safe. There is a mismatch between the content of the belief and the way the emotion apprehends the situation.

The relation of judgment and emotion has long occupied philosophers. While some argue that emotions are evaluative judgments (Solomon 1993), others argue that they result from judgments (appraisal theories, (Moors et al. 2013)), others that judgments result from emotions (Haidt 2001), and others argue that emotions and judgments are co-constitutive (Roeser 2011). We can remain neutral on this issue but want to acknowledge that emotions can have a crucial influence on our judgments. It seems uncontroversial to say that emotions play a role in how we judge things. For instance, a comedy is judged more artistically valuable when it succeeded to generate amusement. Furthermore, it is widely acknowledged that both reason and emotion play a role in determining our judgments and that it is not an either/or question. It is also worth pointing out here that although recalcitrant emotions are contrary to evaluative judgment, this does not mean that to have a recalcitrant emotion automatically means that the person is irrational. For example, Sabine Döring (Döring 2015) has argued that the rational requirement of coherence is violated only if the recalcitrant emotion distorts the reasoning or influences the actions of the person.

An emotion may persist despite the belief that the use of technology as such does not infringe upon or support the value in question. Similarly, an emotion may persist when people believe that the implementation of the innovation does not infringe upon or support the value in question. People who fear a technology or are angry at how a technology is implemented, despite believing that the technology is safe or the implementation is fair, cannot simply be dismissed as being irrational about the technology. The recalcitrance may point to other reasons or motivations that lie deeper and may not yet be accessible to the person. Here, the overarching theme of fittingness comes to the fore because in the light of these reasons and motivations the emotion may actually be fitting.

Taking recalcitrant emotions into account will be of value to approaches that take emotions seriously because recalcitrance can have practical consequences. The recalcitrance of emotions can be problematic because emotions are linked to motivations and actions (Tappolet 2009). We act and judge out of emotions. Emotions involve desires that set a specific goal. For example, fear involves the desire not to be in this situation and to avoid danger, while hate typically involves the desire to harm someone or something. In some cases, because emotions motivate action and judgment, recalcitrant emotions may motivate actions that are contrary to belief or distort judgment. This influence is not necessarily a conscious affair, and we know from psychology that implicit attitudes and self-reports about explicit attitudes can differ (Nosek 2007). This has ramifications for approaches that want to take into consideration the emotions and opinions of stakeholders. One way of assessing what stakeholders think about technology is by asking them. Here, recalcitrant emotions may influence stakeholders to respond differently to what they think. For instance, fear about the *implementation* of technology may influence the response to a questionnaire or in an interview, despite believing that the *use* of technology is safe.

To say that emotions can influence what people think and that emotions can motivate people to act in opposition to what they believe is not to re-introduce the distinction between reason and emotion. It is to acknowledge the intricate interplay between these two and to caution against taking sides without thorough consideration. Recalcitrant emotions should not be automatically dismissed and explicit beliefs should not automatically be favored. Emotions reflect concerns and values. Some emotions may be recalcitrant because the underlying value or concern is very strong and, despite explicit belief to the

contrary, the situation really has implications for these values and concerns. This leads us to the interesting issue of how to dissolve a situation of recalcitrance or whether a conflict between one's emotions and one's judgment should always be avoided or resolved. Recalcitrant emotions may point us towards important issues that our reasoning has overlooked so far and emotions can facilitate better moral decision making by correcting potentially mistaken judgments (Roeser 2012). For example, sympathetic emotions may counteract egoistic reasoning.

Please recall the theme of fittingness of emotions. The narrow focus on one dimension, like quantitative aspects, may prompt the judgment that an emotion is not fitting. However, the emotion may be fitting in one respect and reason may be fitting in another. We should take seriously the idea that emotions can point to underlying values that rational judgment overlooks, thereby helping to correct reasoning. It is worthwhile to conceptually distinguish the following possibilities in cases where reason conflicts with emotions. First, reason may be fitting and emotion(s) wrong. This is the primary stance of most authors, influenced by the rationalistic tradition. Second, emotion(s) may be fitting and reason unfitting. In this case a reassessment of arguments based on emotional capacities need to take place. It is important to acknowledge the reflective potential of emotions rather than seeing them as contrary to rationality and in need of tweaking whenever they diverge from reason. Third, both emotion(s) and reason may be fitting. This can happen in cases where emotion and reason focus on different aspects of a technology, like quantitative versus evaluative aspects, or when one focuses on the implementation and the other on characteristics of the technology itself (see above for the distinction between implementation and characteristics of technology).

We hope to have shown that recalcitrant emotions are worth considering. Although recalcitrant emotions may be hard to address, approaches that take emotions seriously and/or incorporate them should attempt to tackle them. For instance, it seems to be a good idea in deliberation about technology that 'rational' judgment does not automatically takes precedence over emotions, even when they seem recalcitrant. Recalcitrant emotions should be taken seriously in order to bring their underlying concern to the fore and critically reflect on them.

Affective forecasting

We will now turn to affective forecasting. As we will show, this aspect of emotions is particularly worthwhile to consider for approaches that include stakeholder opinions and emotions regarding technology.

People are influenced by their expectations. Sociological 'expectation states theory' posits that the evaluation of objects, events and persons depends on expectations, which influence the emotions (Turner 1999; Turner and Stets 2006). People also anticipate the emotions they will have based on expectations about future experiences. Psychologists refer to the prediction of future emotions as affective forecasting (sometimes also called emotional forecasting).

As it turns out, people are not particularly good at predicting their future emotions, which, given the intimate connection between evaluative judgments and emotions, means that they are not good at predicting their future evaluations. For example, people over- and underestimate how happy or unhappy they will be with a desired

outcome, like being assigned to a preferred dormitory or receiving unwanted results from a pregnancy test (Wilson and Gilbert 2005). Furthermore, people underestimate how quickly they will recover from a negative event and people overestimate the intensity of their emotional reactions to future events (Wilson and Gilbert 2005). There is also some evidence that people overestimate the emotional benefits that come with the attainment of extrinsic goals such as money or fame (Sheldon et al. 2010).

There is a link between affective forecasting, judgment and decisions. Affective forecasting influences decision making because people anticipate how they will feel after having made a certain choice. For example, people pick monetary gambles options with the greatest anticipated pleasure (Mellers and McGraw 2001). Results from gambling experiments may not easily translate to other contexts but there are multiple studies that show similar effects of anticipated emotions on judgments and decision-making. For instance, anticipated positive and negative emotions influence ethical decisions and deliberation of consumers (Escadas, Jalali, and Farhangmehr 2019), and anticipated emotions of pride and guilt affect pro-environmental decision making (Schneider et al. 2017). Furthermore, decisions concerning future quality of life usually take into account the emotions that one expects to have. This is particularly salient when it comes to anticipating how one will emotionally deal with events that severely affect one's health. Some authors have proposed that affective forecasting has an impact on the health decisions that people make[2] (Halpern and Arnold 2008).

To a huge degree affective forecasting impacts the choices that people make because people imagine what the future would be for them, including how it will make them feel. This also applies to decisions and evaluations of technology. When people think and deliberate about the impact of a technology, they usually include the emotional experience they will have (later, we will see that people also make affective forecasts for other people). If people over- or underestimate aspects of the emotional experience, this could compromise the reliability of the process. Affective forecasts and their potential impact should be explicitly addressed in deliberation. As has been pointed out multiple times, one of the major problems for an ethical evaluation of emerging technology (i.e. technology that has not yet been introduced into society) is the problem of uncertainty, particularly uncertainty of potential risks (Brey 2017; Sollie 2007). Because a technology has not been implemented, it is unclear what the exact consequences, uses and effects are going to be. So, the issue of emotional forecasting seems to weigh particularly heavy for anticipatory approaches to the ethics of technology (Brey 2017), especially when they seek to tap into people's emotions to gain insight into what they value and what their preferences are.

In any case, what is needed is more sensitivity concerning affective forecasting and its potential impact on decision-making and judgment regarding technology. A practical suggestion here is that responsible innovation procedures and ethics of technology need to learn to recognize situations where potentially distorting affective forecasting occurs. We will make more specific suggestions of how to deal with affective forecasting in RI and participatory approaches in the last section.

Mixed emotions

We will now turn to mixed emotions as another underexplored aspect of the emotional life that has theoretical as well as practical implications. We will briefly elucidate what mixed

emotions are and then turn to the question of how they are relevant for responsible innovation and technology assessment.

Mixed emotions refer to the phenomenon that several emotions can occur at the same time. (Sometimes this is also called emotional ambivalence). For example, people can be sad and angry at the same time. It is commonly believed that positive and negative emotions cannot co-occur. However, there are indications that people can experience positive and negative emotions at the same time. For example, there is evidence that some film clips can evoke mixed emotions of happiness and sadness (Stanley and Meyer 2009). Furthermore, some studies indicate that mixed emotions of happiness and sadness can be triggered by music (Hunter, Schellenberg, and Schimmack 2008), certain pictures (Schimmack 2001) and advertisement (Williams and Aaker 2002). There are also results that seem to indicate that people can experience mixed emotions of happiness and fear (Andrade and Cohen 2007).

Despite considerable disagreement of how exactly to interpret research results regarding mixed emotions (Larsen and McGraw 2011), we propose that the possible implications of mixed emotions for RI, ethics of technology and technology assessment should be taken seriously. We submit that not taking mixed emotions into account may deprive approaches of a more comprehensive and representative picture of the emotional experiences and underlying values that people have when it comes to technology.

Mixed emotions can be utilized constructively in approaches of technology assessment and deliberation. For example, because emotions reflect values, concerns and preferences, the co-occurrence of emotions may indicate intra-personal conflicts in values. This also connects back to the theme of (in)appropriateness and fittingness. Mixed emotions do not inevitably mean that one of the emotions (or both) is unfitting or inappropriate. The state of mixed emotions can be taken to point to an ambivalent situation in which multiple values are at stake. Theoretical as well as empirical investigations suggest that goal conflict elicits mixed emotions (Berrios, Totterdell, and Kellett 2015). For instance, there can be a conflict between pro-social goals like contributing to charity and goals related to self-interest like saving time and money. This is important for approaches that want to utilize stakeholder emotions and values. To the extent that goals reflect values, it would be worthwhile to have instruments that are fine-tuned enough to pick up on mixed emotions and the potential value conflicts that they are indicative of. This could also contribute to mutual understanding between people. For instance, in cases where they share values but prioritize them differently and accordingly differ in their emotion-value mix. Paying attention to mixed emotions and underlying value tensions may help to find ways to overcome the chasm between people that may be overlooked otherwise. We propose to take the issue of mixed emotions seriously not only as a field of problems but also as a potential source for more understanding in the way that people take different turns while experiencing the tension between values. In the last subsection, we address how RI, participatory approaches and deliberation can take seriously the issue of collective emotions.

Collective emotions

Collective emotions and the role of emotions in groups have also received insufficient attention in the literature on emotions and technology. This is rather curious because

groups and collectives play a crucial role in conflicts regarding technology. Laypeople are in conversation and debate with experts, opponents are pitted against each other, and activists are rallying against the institutional establishment. Further, in the age of digitally connected individuals and social media, collective emotions in cyberspace play a crucial role (Holyst 2017).

Collective emotions are emotions that are shared in the sense that individuals have the same emotion and are mutually aware that others have the same emotion (Salmela and Nagatsu 2016). Examples for collective emotions are the joy, sadness or anger of fans upon seeing their team loosing or winning. Another example is a collective form of guilt or pride in the face of some historical atrocity or triumph respectively. Like emotions of individuals, collective emotions have an underlying concern, a value or goal, that is shared amongst members of the collective.

Collective emotions play an important role for social groups. Mikko Salmela (Salmela 2014a) delineates three functions of collective emotions. Collective emotions can contribute to the formation and maintenance of groups. Groups often form when people have the same emotions regarding some issue. Salmela gives the example of the formation of movements due to shared anger about something. Collective emotions contribute to the maintenance of social groups because they inform the group members about the significance that external events have for the collective goal. When something is appraised as obstruction or facilitation of a collective goal, this elicits negative and positive emotions respectively (van Troost, van Stekelenburg, and Klandermans 2013). Furthermore, collective emotions foster group cohesion through affective bonds. Besides formation and maintenance, collective emotions can contribute to the development or transformation of social groups by changing how members of the group commit to a concern. Collective emotions can transform a group into a group whose members commit to a group ethos (more on group ethos below).

The theme of fittingness also plays a role when it comes to collective emotions. Similar to individual emotions, collective emotions can be evaluated regarding their fittingness. For example, both individual guilt and collective guilt are fitting when there really was a violation. Also, individual and collective fear is fitting when there is a threat. In his discussion of collective pride, Mikko Salmela (Salmela 2014b) delineates standards for the fittingness of collective emotions (although he uses the term appropriateness). According to him, there are two necessary conditions for the fittingness of collective emotions. First, because the members of the group have shared concerns, the collective emotion is fitting in the light of group reasons. That is, when a shared concern is threatened then there are group reasons to be afraid. Second, so Salmela, the group ethos, from which these group reasons derive, should be rational.[3] He gives the example of a racist group and the contempt that its members harbor regarding immigrants and points out that:

> This emotion is warranted by group reasons that emerge from the group's ethos: its racist beliefs and values. Yet this emotion is inappropriate since the group's ethos is maintained by ignoring counterevidence to racist beliefs and values that is available to the group members. To remove this problem, we must require that the group ethos is rational itself. (Salmela 2014b, 25)

Salmela helpfully offers some criteria by which we can evaluate the rationality of a group ethos.[4] There needs to be coherence of attitudes that have a mind-world relation

of fit, like beliefs and judgments. For example, the ethos of a group should not contain mutually exclusive beliefs. As for attitudes with a world-mind relation of fit, such as desires and intentions, they also need to cohere. They have to cohere in the sense that they can be jointly satisfied. That is, there should be no conflict between the states of affairs that the attitudes seek to bring about. For instance, it is not coherent to desire for something to happen and also to desire that it does not happen. Further, the group's world-mind attitudes (e.g. desires, intentions) have to be successful in the sense that they actually serve to achieve the goals of the group. Another condition for the rationality of the group ethos is that available evidence should not be neglected in order to produce or uphold coherence of attitudes.

So, when looking at technology and collective emotions, not only do we have to take a look at the fittingness of collective emotions on the level of group reasons but we also have to take into account the rationality of the group ethos. This is relevant when it comes to collective emotions and technological innovation and technological risk because the group ethos may be irrational, in the sense outlined above, because it is grounded in false information or ignores evidence to the contrary, or because it is founded on problematic or unjustifiable values.

It is also worthwhile to consider the connection between collective emotions and the other neglected issues that we have introduced in this paper. Due to the scope of the paper we will not go into the details here and only briefly touch upon the role these issues play concerning collective emotions. It has been suggested that collective emotions, like emotions of individuals, can be mixed (Sullivan 2015). If this is correct, then most if not all the problems of mixed emotions that we outlined above pertain to collectives as well. Further, based on Salmela's ideas about group ethos and its connection to beliefs, it is conceivable that what we have said about recalcitrance of individual emotions can with some qualifications be applied to collective emotions. That means that collective emotions, like emotions of individuals, may sometimes be recalcitrant. The exact differences between individual and collective recalcitrance and how to address recalcitrance of collective emotions is for future research to uncover. Lastly, regarding affective forecasting, we expect similar issues to come to the fore regarding affective forecasting of collective emotions as for the affective forecasting of emotions of individuals. For instance, similar to emotions of individuals, it might be expected that people have trouble predicting how exactly collective emotions will unfold. All of these potential similarities (and differences) between emotions of individuals and collective emotions await further conceptual elucidation and empirical investigation.

Why is it important to focus on collective emotions? Given the constitutive role of collective emotions for collectives, it is plausible that collective emotions facilitate the creation and maintenance of groups that oppose a certain technical innovation or are in favor of it. The link between emotions and groups is particularly salient when it comes to protest and participation in movements. It is widely acknowledged that emotions are drivers and motivating forces for protests and social movements (Jasper 2018). Emotions are also amplifiers because they strengthen the motives to join, remain or leave a social movement (van Stekelenburg, and Klandermans 2017).

Collective emotions can also serve as catalysts of protests and conflicts regarding technology, particularly big innovation projects. For example, Chan and Protzen point out with reference to the recent protests against the railway development project known as

'Stuttgart 21' in Germany, that when a conflict remains unchecked, it can develop a 'centrifugal force' (Chan and Protzen 2018, 176) that distorts the reasoning process and postpones conflict resolution. It is plausible that collective emotions play a big part when a conflict gets out of hand.

It needs to be noted that collective emotions can motivate collective behavior that is detrimental to the individual private concerns of the group members. For example, communities fearful of becoming victims of violence may collectively stock up on guns, which in turn may lead to more gun violence among its members. Similarly, collective emotions may motivate the collective opposition or support of a technology or innovation, with negative consequences for the private concerns of the members. For instance, being fearful of terrorism can propel collective support for enhanced surveillance but the enhanced surveillance could result in greater social control and infringement of privacy of individual members.

Despite their crucial role in politics, social movements and protests, collective emotions have been insufficiently addressed in the literature on emotions and technology. This is a lacuna that needs to be closed, especially because conflicts concerning technology often involve a conflict of value. There is evidence that suggests that value conflicts tend to escalate more easily than conflicts of interest (Kouzakova et al. 2012). It is highly plausible that emotions contribute to this escalation by fostering group cohesion, contributing to ingroup/outgroup thinking and accelerating protests. For instance, intergroup emotions, that is emotions derived from membership in a group, can become part of group membership and this can accentuate the separation between social groups, motivate behavior towards the out-group and contribute to inter-group conflict (Mackie, Smith, and Ray 2008; Mackie and Smith 2015).

Although there is something to be said regarding the social value of social conflict and some authors seem to hold that conflict should not be avoided at all costs (Cuppen 2018), most approaches seek to eliminate or at least minimize conflict regarding technology. Being aware of the role that collective emotions play in protest and debates concerning technology may contribute to achieving these goals. When emotions are *not* taken seriously, they may fester into long-term emotional climates (Rimé 2007). This has implications for responsible innovation initiatives that include an exchange between groups of people with different interest. A negative emotional climate can lead to defensiveness and aggression, resulting in conflict and a lack of openness to exchange arguments with an opposing group. Trust and openness are crucial for successful deliberation.

In the next section we will give some suggestions of how the neglected aspects of emotions can be incorporated and addressed in RI and STS.

Illuminating the blind spots

Finding ways to incorporate the neglected aspects emotions can be beneficial for approached that focus on stakeholders' values. Consider value sensitive design (VSD). One crucial aspect of VSD is the empirical investigation into stakeholder's thinking, experience and concerns regarding technology and their relation to values. To do this, VSD uses interviews, surveys, and focus groups (Davis and Nathan 2013). VSD researchers also developed unique tools like envisioning cards (for an overview of all value sensitive design methods see (Friedman, Hendry, and Borning 2017)). These cards are intended to

enable value consideration in design, redesign and implementation. Each card focuses on one of the envisioning criteria (stakeholders, time, values, or pervasiveness) and includes an activity. For instance, participants are asked to imagine how their technology will affect people in a couple of years. Given the influence of affective forecasting on how people imagine the future, the cards could be complemented by asking people to reflect on how emotions color expectations and evaluations of future scenarios. This would increase the sensitivity of both stakeholders and VSD researchers for the influence of affective forecasting.

Speaking of affective forecasting, there are ways to address and ameliorate affective forecasting errors. Evidence suggests that framing has an influence on affective forecasting (Wilson and Gilbert 2003) and the kind of scenario that is presented to people can reduce framing effects by mitigating potentially erroneous affective forecasting (Fu et al. 2018). That is why researchers who aim to employ emotions in the service of technology assessment or responsible innovation should (and usually do) take into consideration how they frame scenarios, examples, questionnaires and so on.

To capture some of the neglected aspects of emotions, responsible innovation researchers may want to consider focusing on a longer time frame. One idea here is to do longitudinal cases studies that include a diary where people note down their emotions. This has a good chance of capturing mixed emotions and related values and value conflicts. Researchers in other disciplines successfully used diaries and diary questionnaires (Bolger, Davis, and Rafaeli 2003), including diaries that focus on emotions (Bellocchi 2015). Responsible innovation researchers could modify these methods to suit their needs.

Participatory foresight approaches can benefit from attention to the neglected issues we presented in this paper. Among the participatory methods, the emotional deliberation approach to risk (Roeser and Pesch 2016) explicitly encourages people to share their emotions, urges discussion leaders to motivate people to tell narratives and ask questions about their emotions. This emotional deliberation approach can be supplemented by the inclusion of the emotion aspects that we introduce in this paper. For instance, discussion leaders could prepare to pay attention to how narratives may be colored by emotional forecasting and encourage participants to convey and elaborate on mixed emotions. Reflecting on mixed emotions can provide a window into value conflict.

Participatory foresight includes stakeholder interviews, focus groups, and scenario methods. Stakeholder interviews is a way to gauge people's values, concerns and visions about technology and innovation. Interview protocols could include questions regarding emotions and follow-up questions that focus on particular aspects, like asking people to elaborate and reflect on situations of emotional recalcitrance. This is not limited to personal emotions. For instance, in her interviews with nano-scientists about their motivations and concerns, Berne (Berne 2005) included a question about how others would feel about their work. In a study with interviews on responsibility in nanotechnology governance (Foley, Bernstein, and Wiek 2016), stakeholders were asked to narrate their experience with nanotechnology. Here, prompts to narrate experiences could encourage people to focus on emotions, including ambivalent and mixed ones. Social scientists have proposed methods, like narrative analysis, for the investigation of emotional experience. These methods are especially useful when people do not express their emotions clearly (Kleres 2011). Some researcher have also deployed non-traditional survey methods (as opposed to the classic Likert scales) to assess the emotional views involved

in stakeholder's engagement with technological development (Sleenhoff, Cuppen, and Osseweijer 2015). RI researchers could adapt these analytical tools to investigate some of the neglected emotion aspects.

A similar tactic seems suitable for focus groups. These are small moderated discussion groups with stakeholders to figure out their preferences and opinions. For instance, Gaskell and collogues (Gaskell et al. 2013) used surveys and focus groups to investigate the public's attitudes regarding biobanks. By paying attention to verbal cues, moderators of focus groups could be more sensitive to the expression of mixed and ambivalent emotions of participants. Moderators could also encourage discussions about these emotions. Furthermore, to capture mixed emotions, the topic guide for focus group discussions could include adaptations of already existing proposals for questions about participants' emotions (Nihlén Fahlquist and Roeser 2015).

Scenario methods (Börjeson et al. 2006) is another tool in participatory foresight. Scenarios can be used to cultivate anticipation and reflection of actors involved in innovation. Scenarios illuminate the complexities of the interests and values involved in potential future outcomes of the innovation process. For example, participants have been asked to anticipate what each scenario means for the public at large and particular populations (Keeler, Bernstein, and Selin 2019). By considering multiple possible scenarios, participatory scenario creation can also help actors to explore alternative innovation paths and bring hidden assumptions to light. Here, paying attention to affective forecasting and mixed emotions could enhance scenario methods. For instance, in the scenario building stage participants could be asked to write a short essay about the emotions they anticipate they will experience regarding a technology. Because emotions are linked to values, a critical engagement with emotional forecasting is a way to reflect on underlying concerns that would otherwise covertly influence the scenario building. Emotional forecasting shapes the anticipation of the future and making this influence explicit can help to tease out what people value now and what they think they and other people will value in the future. This reflection can also mitigate the potential distorting effect of emotional forecasting. Scenario building could also include the exploration of mixed emotions as a way for participants to explore multiple values of various scenarios.

So far, scholarship in RI and STS has not paid much attention to the collective dimension of emotions. For instance, recent work on the emotional aspects of research collaborations (like the contributions in Griffin, Bränström Öhman, and Kalman 2013) or investigation of collaboration and emotion in interdisciplinary research teams (Boix Mansilla, Lamont, and Sato 2016), did not consider collective emotions. Neglecting collective emotions means missing out on an essential aspect of social life because collective emotions contribute to group cohesion and inter-group dynamics. To capture the collective dimension of emotions, RI researchers could employ methods that have been successfully used in social science. For instance, dialogical content analysis and lexicometric analysis have been used to capture collective emotions in focus group discussions (Caillaud et al. 2016). Furthermore, accounts in STS that take emotions to be shared and extended across individuals (Lupton 2013) could be supplemented by looking into philosophical theorizing about collective emotions.

Stimulating public conversation and deliberation is a vital aspect of responsible technology development. The collective dynamics, including collective emotions, are relevant for public deliberation. Social science studies show that the public conversation alternates

between cognitive and emotional language and that collective emotions have a rhythmic quality (Bail, Brown, and Mann 2017). Knowledge of this and other phenomena related to collective emotions can help enhance the quality and success of public deliberation. For example, being aware of the impact of collective emotions on intergroup dynamics and deliberation can be the first step in a collective reflection on this impact, thus mitigating potential distortions and bringing to light underlying group values.

Conclusion

In this paper we have identified and explored four aspects of emotions that have received insufficient attention in RI, STS and ethics of technology so far: emotional recalcitrance, affective forecasting, mixed emotions, and collective emotions. We have also indicated how these neglected aspects can be incorporated in various RI approaches and methods.

Taking into account recalcitrance of emotions, affective forecasting, mixed emotions, and collective emotions is a step towards greater theoretical sensitivity vis-à-vis emotions. As a matter of epistemic quality management, all approaches and procedures should strive to have a clear-headed picture of the impact of emotions. This includes recalcitrant emotions, affective forecasting, mixed emotions, and collective emotions. Our exploration of these neglected issues can provide the foundation for enhancing the epistemic quality of ethics of technology, responsible innovation and technology assessment. The aspects of emotions addressed in this paper can potentially distort decision-making procedures and participatory approaches, so it is important to be aware of them and address them. We have explored some first steps on how these aspects can be addressed. Further research is needed to study the implications of these aspects in detail and how to address them in practical approaches.

Future research could also go beyond the neglected aspects that we have presented and look at interesting connections to other phenomena. For instance, affective reactions regarding one characteristic of the technology may color the judgment of other characteristics. That the perception of one feature colors the judgment of another feature of the same entity is known as the 'halo effect'. Closely related to the halo effect is a phenomenon called spillover, where an evaluation of one entity extends (or spills over) to the evaluation of another entity. For example, a scandal involving one brand or unethical behavior by one company can affect how the product category and other brands are judged (Roehm and Tybout 2006; Trump and Newman 2017). There is recent evidence for a spillover effect concerning emerging technologies. Heather Akin and collaborators (Akin et al. 2018) found that the attitudes and risk perceptions of people concerning genetically modified food influence their judgment regarding nanotechnology. Based on the available empirical evidence regarding halo effect and spillover, we think that it is plausible that something like the halo effect and spillover also occurs when it comes to technology and its implementation. The positive or negative affective reaction to the characteristics of a technology may color the assessment of the decision-making procedure or implementation of the technology, and vice versa.

It is our hope that by taking a closer look at the aspects of emotions analyzed in this paper, scholars and practitioners working in STS, ethics of technology, responsible innovation and technology assessment will be able to improve the overall quality of their accounts, procedures, approaches and methods. Emotions can play an important role in

responsible innovation by being gateways to values. However, in order to do so, blind spots in scholarship have to be properly understood and addressed to let emotions play a constructive role.

Notes

1. An example for the social struggle regarding emotion norms is the gendered dimension of some emotion norms. Females are not supposed to have or show certain emotions, like rage. Recently, emotion norms regarding female rage has been questioned and its political potential has been defended (Chemaly 2018).
2. Of course, one should not overlook important differences between health and technology here. For example, negative health issues (e.g. sickness) are often involuntary, whereas the risks of technology are often human-made and hence partially avoidable (Roeser 2014).
3. Here is Salmela's full rendering of his proposal:

> I propose that a collective emotion is appropriate if it is felt for a group reason that emerges from an internally coherent group ethos whose aspects have not been adopted or maintained by ignoring counterevidence that is available to the group members (24).

4. We would like to point out here that there are multiple ways of specifying rationality and that being rational, in the sense outlined by Salmela, may not be sufficient for moral correctness. For example, an individual can be rational and a racist.

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