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Discussing Ethical Impacts in Research and Innovation:

The Ethics Canvas

Abstract. Technologies are increasingly intertwined with people's daily lives. Consequently, there is an increasing need to consider the ethical impacts that R&I processes, both in commercial and non-commercial contexts, bring about. However, current methods that offer tools for practicing ethics in R&I inadequately allow for non-ethicists such as engineers and computer scientists to practise ethics in a way that fits the character of their work. As a response, we propose a tool for identifying ethical impacts of R&I that is inspired by a method for the generation of business models, the Business Model Canvas. This tool, the Ethics Canvas, allows researchers to engage with the ethical impacts of their R&I activities in a collaborative manner by discussing the different building blocks that together comprise a comprehensive ethical interpretation of a technology. To assess the perceived usefulness of the Ethics Canvas, a classroom experiment was conducted, followed-up by a questionnaire. The results suggest that the Ethics Canvas (1) is perceived as useful for identifying relevant stakeholders and potential ethical impacts and (2) might trigger changes in technology designs or business models.

Keywords: Ethics Canvas · Applied ethics · Responsible research and innovation · Practising ethics

1 Introduction

Due to the increasing pervasiveness of technologies in people's everyday lives (e.g. social media, artificial intelligence, genomics, communication and transportation technologies), it becomes increasingly important to reflect on the ethical impacts of

research and innovation (R&I) processes and their outcomes. In academic R&I settings, ethical considerations are typically mediated by professional codes of conduct and more or less bureaucratic "ethics clearance" procedures. In commercial R&I settings, ethical considerations are far less systemised and are often predominantly effectuated through legal requirements (e.g. data protection regulation). Both in and outside academia R&I, practices show considerable shortcomings because they are usually reactive, not suitable for anticipating potential ethical impacts and not in accordance with the notion of ethics as a reflective activity. Accordingly, there is a need for developing new methods and tools to guide the practice of ethics in R&I processes, which has led to a burgeoning literature on practising ethics in R&I.

This paper proposes a novel tool for discussing ethical impacts in the process of R&I. We conceptualise the R&I process as consisting of four distinct stages: (1) the formation of (scientific) knowledge and concepts that can be operationalized for technological applications, (2) the translation of this knowledge into a technology design, (3) the prototyping and testing of this design and (4) the introduction of the R&I outcomes into society [1]. Each of these stages of the R&I process can bring about distinct ethical impacts. However, existing methods that offer tools for practicing ethics in R&I do not adequately facilitate the discussion of these impacts amongst R&I practitioners[1]. Below, we identify an important shortcoming in existing methods for practicing ethics in R&I. In order to improve the way ethics is currently dealt with in R&I processes we then propose a novel tool that enables R&I practitioners to engage with the ethical impacts of their R&I activities.

To achieve this, we searched for an extensively adopted tool that facilitates accessible and clear processes of discussion and reflection amongst non-experts. Consequently, we transformed a business modelling tool that is widely used in business development practices, the Business Model Canvas (BMC) [2], into the "Ethics Canvas". The Ethics Canvas is a collaborative brainstorming tool that has two distinct aims: (1) to have R&I practitioners come up with and discuss possible *ethical impacts* of the technologies they develop, and (2) to have R&I practitioners consider

[1] With "practicing ethics" we refer to any way of doing ethics R&I processes in the broadest sense.

pivots in their technology design or business model to avoid or mitigate the negative ethical impacts. The overall aim of this tool is to foster ethically informed technology design by improving the engagement of R&I practitioners with the ethical impacts of their R&I activities. We assessed the perceived usefulness of the Ethics Canvas by putting it into practice in a classroom situation of business & IT students who were developing novel technological applications. A follow-up questionnaire that the students filled in provided some initial suggestions with regards to the usefulness of the Ethics Canvas for practising ethics in R&I.[2]

In what follows, we first shortly discuss existing methods that offer tools for practicing ethics in R&I and discuss an important shortcoming of these methods. Second, we discuss methods used in modelling business models that can offer tools for overcome this shortcoming. Third, we propose the design of the Ethics Canvas that is inspired by the Business Model Canvas approach in business modelling research. Fourth, we explore the merits of the Ethics Canvas in a practical setting by evaluating the outcomes of a questionnaire that students filled in after having engaged in the Ethics Canvas exercise that related to a technological application they were working on.

2 Challenges for Practising Ethics in R&I

In recent years, there has been a strong increase in discussions about responsible R&I [3], responsible technology design [4] and responsible approaches to instructional technology research [5]. This tendency is due to growing concern about ethical impacts that technological innovations can have on our society, intensifying public debate and mounting concerns about unsustainable technological developments (pollution, climate change, etc.). Policy makers reinforce the move towards responsible R&I, for instance by incorporating ethics assessment practices in funding mechanisms, as is the case in the framework programmes of the European Union [3]. According to Stilgoe et al. [6], literature on responsible research and innovation generally focuses on four dimensions of the assessment of R&I practices: (1) the anticipation of future societal impacts of technology design, (2) reflection on the

[2] This study has been approved by the Trinity College Dublin Research Ethics Committee

values that are implied in technology design, (3) inclusion of stakeholders in the design process and (4) responsiveness of technology design to societal changes. Ethical impacts of technologies form an important consideration in this context of responsible research and innovation, since all of these four dimensions consider aspects of human-technology interactions or relations that have a strong normative significance.

Resonating with at least the first three dimensions of responsible R&I, methods for practising ethics in R&I are (1) dealing with uncertainty of technological change, such as anticipatory technology ethics [7], (2) enabling, organising and ensuring ethical technology design, such as ethical impact assessment [8] (3) identifying, analysing and resolving ethical impacts, such as the ethical matrix [9] and (4) enabling, organising and ensuring appropriate stakeholder participation, such as value sensitive design [10, 11]. Not each method for practising ethics falls neatly into one of these categories of use, but these categories nonetheless provide a useful overview of the core aspects of practising ethics in R&I that should be taken into account. We will restrict ourselves predominantly to the issue of enabling, organising and ensuring technology design. One critical shortcoming of current methods is that they insufficiently manage to offer tools to integrate ethics in the day-to-day work of R&I practitioners [11]. Many of the methods for practising ethics in R&I offer tools that are targeted at ethicists and are not likely to be easily adopted by R&I practitioners in their everyday activities because they might, for example, presuppose special ethics expertise or be framed in a jargon discourse. As a result, for instance, an R&I practitioner cannot simply engage in value sensitive design by following the proposed steps in the respective literature. Similarly, an ethical impact assessment needs the involvement of people that manage the assessment process and offers little grounds for R&I practitioners to assess their day-to-day work.

Yet, the engagement of R&I practitioners in practising ethics is crucial for achieving ethical technology design. In the overall process of practising ethics, Brey [12] distinguishes a *disclosure* level, at which ethical impacts are explored and identified, a *theoretical* level, at which theoretical frameworks are developed and employed to evaluate these impacts and the *application* level, at which moral deliberation takes place as the basis for overcoming the negative ethical impacts in the

R&I process. According to Brey, the disclosure level is aimed at revealing, or rather identifying the potential ethical impacts of a technological application. He accentuates the role of R&I practitioners in dealing with ethics in R&I at this level, arguing that they play a vital role in disclosing ethical issues of emerging technologies and in making sure that technology design choices are informed by considerations of these ethical issues [12, p.128]. The argument Brey presents is that researchers, designers and innovators are important actors at the disclosure level, because they have an understanding of the technology that many ethicists and policy-makers lack. Hence, we have good reasons to look for a novel tool that overcomes the shortcomings of tools offered by existing methods and facilitates engagement of R&I practitioners with ethics in their day-to-day work[3].

Resulting from the foregoing considerations, we propose two requirements that such a tool should satisfy. First, it should be *accessible* to non-ethicists, or people without a substantial background in ethics. This argument is reinforced by the Council for Big Data, Ethics and Society, which argues that ethics engagement should happen in "hybrid spaces" in which people with different roles in the R&I process collaborate [14, p.4]. Second, it should allow for people with different roles and backgrounds to work *together* on the identification of ethical impacts. The different interpretations people have of the potential ethical impacts of technologies can be brought to the table by means of a collaborative process, in which multiple people involved in an R&I process express their expectations of potential ethical implications in the form of certain narratives (i.e. for this group of stakeholders, such-and-such feature of our technology can have such-and-such ethical implications). As we will see later, this requirement fits with theories in Science and Technology Studies (STS) that explain how our understanding of technologies results from an interaction between different interpretations of technologies for different people [15].

In line with these two requirements, we have to make sure that the threshold for using our tool should be low and that it should be possible to use it without thorough

[3] For our current purposes and the scope of this paper it is not feasible to propose a full-fledged method. However, the Ethics Canvas tool fits with a newly developed method that introduces a narrative approach in ethics of technology [cf. 13].

background knowledge of ethical theories or conceptual discussions of values. Additionally, the tool should facilitate an open-ended process of interpretation in a collaborative fashion to identify potential ethical impacts of an R&I process and its outcomes. At the moment, methods in the fields of applied ethics and ethics of technology offer no tools that successfully fulfil these two requirements. For this reason, we decided to look at fields that are unrelated to academic ethics, but that do focus on creating low-entry tools for collaborative processes of discussion and interpretation; focusing on a specific use case. This brought us to the field of business development, and notably the field of business model development.

3 Turn to the Business Model Canvas

In the field of business model development, some discussions of responsible research and innovation have already emerged. For instance, Henriksen et al. discuss business models that promote sustainable ways of production, or "green business model innovation" [16]. In a similar vein, Bocken et al. explain how a re-definition of the notion of "value" in business models can help rendering businesses more sustainable, for instance by focusing on the entire supply-chain [17]. However, these approaches primarily focus on the design of the business case (in terms of resources, customers, etc.) and not on technologies that are developed in R&I processes. Therefore, we want to investigate how we can transform existing business model development approaches to align them with our aim of constructing a tool for disclosing the ethical impacts in R&I processes in which technologies play a crucial role.

Before we do so, however, we have to address the question of to what extent tools in business model development methods incorporate the two requirements we introduced in the previous section: (1) engaging non-ethicists with the disclosure of ethical impacts and (2) of facilitating this as a collaborative process of interpretation. We can observe how business models are defined in the literature. As pointed out by Zott, Amit and Massa [18, p.1024], a business model can be understood as an "architecture", a "heuristic logic", a "concise representation" and also a collection of "stories", aimed at describing and explaining how a particular enterprise functions or operates. It seems that a spectrum of business models can be identified, with on the one hand business models that are meant to offer a strict representation of both

internal and external processes of an existing corporation, and on the other hand models that use stories to give an account of these processes – possibly of businesses that do not already exist (i.e. a model for a start-up). The latter type of business modelling approaches would be particularly interesting for our inquiry, since it appears to focus on an understanding of business processes in terms of narratives that are constructed through social interaction.

Lucassen et al. [19, p.13] use two indicators that capture the two aspects of the abovementioned spectrum (between models that are strictly representational and those that are the result of people's interpretations) to review and compare different visual business modelling approaches: the notion of "capturing" to indicate to what extent a business modelling method accurately represents a business process and the notion of "communicating" to indicate to what extent a business modelling tool is accessible, and generates understandable outcomes. They argue that the so-called Business Model Canvas (BMC) is most successful with regards to the indicator of "communicating", compared to two other established models[4] "because it effectively models explicit information of both tangible and intangible aspects of the business and communicates this information in a highly accessible manner to parties unfamiliar with the modelling technique" [19, p.14]. As Kuparinen argues, the business model canvas can be classified as a "narrative business model" [20, p.i], being the result of "participant narratives" [21, p.2]. The BMC provides a visual-linguistic tool (see figure 1) that can be used in a collaborative process in which participants generate ideas by offering and discussing certain narratives that are related to the thematic boxes displayed on the canvas.

Thus, it seems that of the existing business modelling approaches, the BMC fulfils the two requirements we formulated. First, as Lucassen et al. [19] argue, it is highly accessible and understandable to people without specific knowledge of the field. If the structure of the BMC can be incorporated in a tool for disclosing ethical issues, it would be an answer to Brey's [12] concern regarding the disclosure level for it allows researchers to engage with ethical reflection in an accessible manner without

[4] The two traditional business model approaches that the business model canvas was compared with are the "software ecosystem model" approach and the "board of innovation" approach (Lucassen et al. 2012: 6).

them having to have thorough knowledge of the field of applied ethics. Second, since the BMC relies on the collaborative generation of participant narratives, it seems to satisfy the second demand to a large extent. It allows the participants using this method to engage in a collaborative process of interpreting and discussing business processes. Considering the foregoing arguments, turning towards the BMC is justified in trying to find a tool for disclosing ethical impacts in R&I processes. However, we need to transform the BMC, which is clearly focused on discussing business processes and has little to do with ethics, into a tool that can be used in the context of practicing ethics in R&I.

4 Designing the Ethics Canvas

To explain the process of designing the Ethics Canvas, we first briefly describe the BMC and discuss its aims and the way in which it is used in a collaborative setting. The BMC was developed by business theorists Osterwalder and Pigneur [2] as a visual-textual plane that is divided up into nine "building blocks" through which a business model can be described in a holistic manner. It is argued that a business model can be defined as a model that "describes the rationale of how an organisation creates, delivers, and captures value" [2, p.14], and that this definition can be captured by discussing all the "building blocks" of a business model. By engaging in a collaborative discussion about the different building blocks of a business model, such as 'key partners', 'channels' and 'revenue streams', participants working with the BMC are able to arrive at a comprehensive understanding of the way in which their organisation is supposed to create, deliver and capture value.

In its original form, the BMC is printed on paper and used as the core instrument for a collaborative workshop. In addition to the canvas, Osterwalder and Pigneur provide for a handbook that provides guidance for the workshop participants in understanding the meaning of the different building blocks and presents use-cases of the canvas as well as techniques for designing better business models. The printed canvas is used as the focal point of a collaborative workshop, with participants discussing and writing down ideas for each of the building blocks. Next to the original

BMC, there exist online applications that offer digital versions[5] of the canvas, through which teams of different sizes can create multiple business models and save them in their accounts. Figure 1 below shows the design of the BMC. The BMC has experienced widespread adoption in the business modelling of start-ups. Its ease of use in capturing and communication a business model lends itself well to the identification and resolution of uncertainties typically facing teams developing a start business model. Blank [22] describes how BMC is now widely used in the teaching of start-up business modelling to research and innovation across universities in the US. In this capacity, the BMC is used as an easily updated 'scorecard' for documenting the development of pivots in a business model when following Blank's own iterative, evidence-driven Customer Development methodology [23] combined with Eric Reis' agile approach to start-up development [24]. Osterwalder et al [25] have also elaborated how the value proposition and customer segments elements of the BMC can be further categorised in the detailed modelling and testing of product market fit. These developments indicate that the form of the BMC has proven adaptable both to integration into independently developed methodologies as well as for methodological elaboration in critical areas. The use of this form in the design of the Ethics Canvas also aims therefore to work both as us useful tool for teaching and in practice as well as the basis for future methodological development.

[5] See for instance https://strategyzer.com/ and https://canvanizer.com/new/business-model-canvas

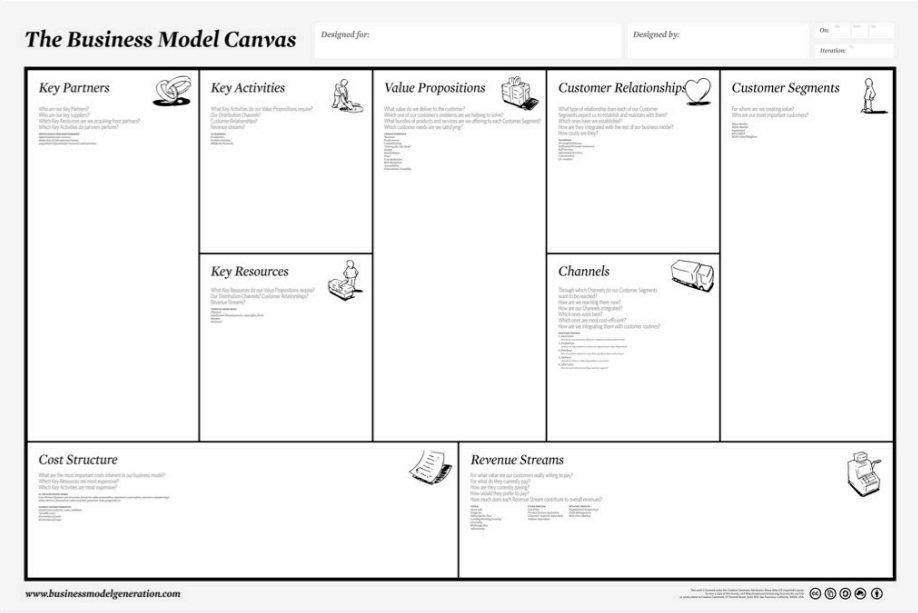

Figure 1: The BMC [2].

Taking the business model canvas as a starting point, we aimed at transforming it in a way that would allow its users to discuss how a technology might bring about ethical impacts for different stakeholders instead of discussing a business model. To provide this, we considered the different building blocks that could amount to a holistic ethical analysis of a certain technological application. The building blocks were constructed in a two-way process: by considering literature in Science, Technology and Society studies (STS) and philosophy of technology, and simultaneously engaging in a trial-and-error exercise of using the Ethics Canvas to improve its user-friendliness.

We consulted literature that provides accounts of different aspects of impacts of technologies on individuals, groups and society as a whole. We need to stress that this consultation was mostly aimed at pragmatically gathering different vantage points to consider ethical impacts of technology, and not to provide a coherent theoretical framework underpinning the Ethics Canvas. The STS literature offers useful accounts of the way in which technologies are embedded in relationships between different "relevant social groups" [15, p.35], which can be types of individuals (e.g. producers, technology users, women, elderly) or institutional, collective actors (e.g. government,

companies, labour unions). Akrich [26] discusses the Actor-Network Theory (ANT) approach and shows how technologies can have impacts on actors that are not directly connected to its design, production or use such as non-users but also non-humans (understood as e.g. the impact of a mobile phone on a supply chain for raw materials). According to her, technologies can politicise social and material relations, which can for instance be understood by considering how non-users of social media applications can become marginalised. In order to understand *how* technologies can impact relevant individuals or groups, we can turn to writings in philosophy and technology. Ihde [27] and Verbeek [28] show how individuals can change their behaviour or relationships by engaging with technologies. For instance, Verbeek shows how the ultrasound technology has transformed the relationship between parents and their unborn child [28, p.140], and how technologies, such as traffic lights and speed bumps, impact the behaviour of car drivers [28, p.159]. Feenberg [29] goes beyond the focus on the technological mediation at the level of the individual, by arguing how technologies can impact relations *between* people and collectives, for instance between workers and their companies, between governments and labour unions. In line with this, he shows how technologies can impact the public sphere, in which "everyday communicative interactions" take place [29, p.167], in which worldviews are formed and social conflicts arise. Finally, scholars discussing "constructive technology assessment" show that we should also take into account impacts of technologies on the environment and production processes [30].

Although this overview does not provide a full-fledged and exhaustive review of literature dealing with the impacts of technologies on humans, groups, and society as a whole, it does give us an adequate picture of what the building blocks of our Ethics Canvas could look like. To summarise, we can infer the following characterisations of technology impacts from the literature:

- Ethical impacts occur as relations between technologies and different types of actors, which can be types of individuals and types of collectives, or groups.
- Technologies can mediate the behaviour of individuals, but also the relations that people have with one-another.

- Technologies can mediate the worldviews of social groups and can bring about social conflicts between social groups.
- A technology impacts the network in which it is designed, produced and used, including for instance the supply chain it constitutes and the natural resources it needs.

While taking the abovementioned characterisations of technology impacts as a guideline, we entered into a trial-and-error design process of the Ethics Canvas. This design process was aimed at making sure that the rationale of the Ethics Canvas design would not only be grounded in the relevant literature, but that it would also be user-friendly and intuitive. Based on the literature, we designed nine different versions of the Ethics Canvas, all with different building blocks and layouts. These designs were iterated through a series analysis exercises conducted by the Ethics Canvas design team, which consisted of the authors of this paper and other researchers who collectively possessed expertise in applied ethics, personalisation in digital applications, knowledge engineering, software engineering and innovation methodologies. In addition, iterations of the ethics canvas were trailed in teaching and training settings with over 260 undergraduate and postgraduate students in computer science, engineering, business studies and working on groups on pre-assigned digital application designs. This provided a further source of design insight into improving the usability of the ethics canvas design. The criteria for success we used during these meetings were that users (1) should be able to complete the entire canvas within a reasonable amount of time (a maximum of 1,5 hours) and (2) should be able to address each building block without having to consult any external source.

As a result of this exercise, some important changes were made concerning the wordings of each box, because some terms use in the consulted literature (e.g. collective, human-technology-world relations, ideology) were not intuitive for the users and needed to be translated into concepts that are more easily usable (e.g. group, behaviour, worldview). Eventually, this design process brought us to the current design of the Ethics Canvas (figure 2).

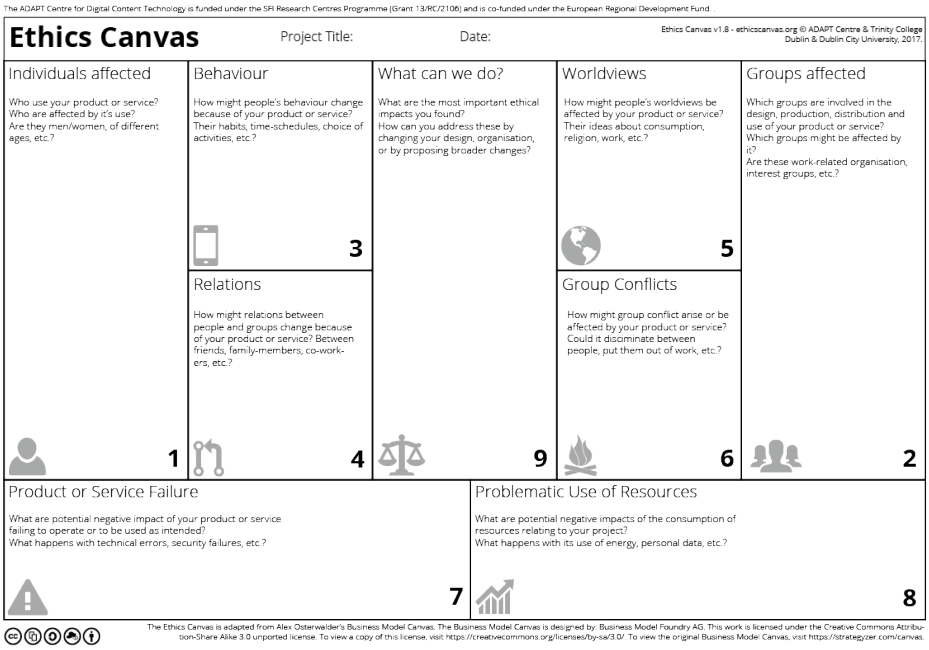

Figure 2: The Ethics Canvas, version 1.9.

The Ethics Canvas is organised according to nine thematic blocks that are grouped together according to four different stages of completing the canvas. The first stage (blocks 1 and 2) challenges the participants to consider which types of individuals and groups might be relevant stakeholders when considering a specific technology. The second stage (blocks 3 to 6) asks the participants to consider potential ethical impacts, considering the different stakeholders that were identified. The third stage (blocks 7 and 8) asks the participants to consider potential ethical impacts that are not stakeholder specific, pertaining to product or service failure or any problematic use of resources. The fourth stage (block 9) challenges participants to think beyond the potential ethical impacts they discussed and discuss some initial ideas for overcoming these ethical impacts. The complete Ethics Canvas exercise in a physical space consists of the Ethics Canvas that is printed on paper, on which the participants can write down their ideas, and the Ethics Canvas Manual [31] that provides guidance on how to conduct the exercise. Additionally, we have created an online version of the

Ethics Canvas[6]. People can collaborate to complete a particular Ethics Canvas online while being in different physical places.

5 Assessing the usefulness of the Ethics Canvas

The BMC is a widely used tool for business model development and has been positively assessed [19]. We wished to similarly assess the Ethics Canvas and its usefulness as a tool that supports practising ethics in R&I settings. Comparisons with another tool for practising ethics in R&I are not possible due to lack of similar tools that are used in day-to-day activities of R&I practitioners. Therefore, we assessed the Ethics Canvas through evaluating its perceived usefulness amongst its users and its anticipated effects related to follow-up activities.

We organised an Ethics Canvas pilot with students who were required to create a new ICT application as part of their coursework. The students attended a one-hour lecture at which the content of the Ethics Canvas Manual was presented. After this, the students were given the assignment to complete the Ethics Canvas in groups, using the online version for their particular R&I project in approximately one hour. Students were free to meet up in a physical space or to hold a conference call for completing the exercise. A total of 109 students participated in the Ethics Canvas exercise, organised into groups, each comprising of 3 or 4 students. After the groups had completed their Ethics Canvasses, all participating students were asked to fill in a questionnaire that asked them about their perception of the usefulness of the Ethics Canvas to practise ethics in their respective R&I projects. Filling in the questionnaire was voluntary. The feedback questionnaire was filled in by 31 students, which represented 28% of the total number of students who worked on the Ethics Canvas exercise (109).

The questionnaire followed a 5-point Likert scale, with a 1-point assessment indicating strong disagreement and a 5-points assessment indicating strong agreement. Statements were formulated in the affirmative mode and as negations to be able to assess whether participants paid attention to the statements. The participants were asked about (1) the perceived usefulness of the Ethics Canvas (e.g.

[6] https://ethicscanvas.org/index.html

did the Ethics Canvas add to the overall understanding of ethical considerations?) and (2) the anticipated effect of the Ethics Canvas (e.g. did the exercise influence the business model and or technology design?). In what follows, these two aspects are discussed based on reflections on the questionnaire results.

The *perceived usefulness* of the Ethics Canvas was evaluated extensively in the questionnaire. Generally, 56% of the participants agreed and 28% strongly agreed that the exercise improved their understanding of the potential ethical impacts of their R&I projects. Participants were asked whether the Ethics Canvas exercise widened their understanding of different individuals or groups affected by their project, to which 44% of the participants replied that they agreed and 29% that they strongly agreed. Being asked whether the exercise helped them create a broad overview of potential ethical impacts of their project, 42% of the participants agreed and 35% strongly agreed. To further the scope, the participants were asked whether the ethical impacts they discussed in the task sufficiently fitted the structure of the Ethics Canvas. Here, 40% of the participants agreed and 21% strongly agreed. To assess the value of the Ethics Canvas in stimulating productive discussions, participants were asked whether they considered any ethical impacts that were not known to them or unclear beforehand. Only 21% of the participants disagreed or disagreed strongly with this question, indicating that the majority of the participants discussed ethical impacts that were new to them. This suggests that the Ethics Canvas can be a useful tool to guide participants into discussing ethical impacts that group members didn't know or didn't clearly think of beforehand.

The second theme of the survey focused on the assessing the anticipated *effect* the Ethics Canvas has the business model and technology design of the ICT application that the students are working on. First the participants were asked whether the exercise would have any impact on their project's technology design, resulting in 32% of the participants agreeing and 16% strongly agreeing. A similar question was asked in relation to the impact of the canvas on the business model. Here, 52% of the participants agreed and 5% strongly agreed. Finally, the participants were asked whether the task was useful in promoting the group's ethical behaviour. The results indicated that 35% of the participants agreed and 40% even strongly agreed. Even through these outcomes do not directly indicate that follow-up actions have taken or

will take place, they at least indicate an intention amongst the students to use the outcomes of the Ethics Canvas exercise to adjust their business model or technology design.

Overall, the results suggest that it is reasonable to state that the Ethics Canvas is perceived as a useful tool to guide participants in discussing a broad range of ethical impacts as well as the identification of relevant stakeholders. Moreover, the results indicate that reasonably assume that the Ethics Canvas can lead to the intention of participants to reconsider their business models or technology designs. Nevertheless, results also indicate that the structure of the Ethics Canvas will need to be improved to be more inclusive of potential ethical impacts. Moreover, our study is limited due to the limited participation rate (28% of all the students who worked on the Ethics Canvas exercise). This might possible have led to biased results, because the cohort of students that voluntarily filled in the questionnaire could have coincided with the cohort of students that was most positively engaged during the Ethics Canvas exercise. Hence, even though these initial results positively suggest that the Ethics Canvas is a useful tool for practising ethics in R&I, further development of the Ethics Canvas and additional ways of assessing its usefulness will be needed for future studies.

6 Conclusion

In this paper, we presented a novel tool for the discussion of ethical impacts in R&I settings. The Ethics Canvas responds to shortcomings in the current methods that offer tools for practicing ethics in R&I, concerning the lack of ways in which R&I practitioners can engage in practising ethics in their day-to-day work. We argued for two requirements for constructing a suitable tool for addressing the disclosure stage: that it should be accessible and clear to R&I practitioners and that it should facilitate a collaborative process in which people can discuss different interpretations of impacts of technologies. Since no existing tool in the field of ethics of technology seemed to address this need in an adequate way, we turned to the field of business model development instead. In this field, we assessed the BMC as a suitable tool because it is highly accessible to different types of people, and structures a collaborative effort to discuss issues surrounding a central goal. We designed the Ethics Canvas by re-

directing the focus of the canvas format from business modelling to a comprehensive identification of ethical issues of an R&I process. Utilising established theories in philosophy of technology and STS that are aimed at understanding ways in which technologies can impact the behaviour and relations of individuals and collectives, and engaging in a trial-and-error design process, we formulated different building blocks of the Ethics Canvas. Finally, we put the Ethics Canvas to the test in a classroom setting, which resulted in initial positive results, which suggest that the Ethics Canvas is perceived as a useful tool for discussing relevant stakeholders and potential ethical impacts in R&I projects and for triggering anticipations of pivots in business models or technology designs. However, more studies will need to be done to further develop the Ethics Canvas and assess its usefulness in multiple ways.

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