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EXECUTIVE SUMMARY

The ETHNA project aims to develop a governance structure (ETHNA, 2021) that can contribute to ensuring that research and innovation processes are responsible, in the sense of being ethically acceptable and socially desirable. In this article, we analyze the implementation of responsible research and innovation (RRI) in research and innovation (R&I) in Higher Education, Funding and Research Centres (HEFRCs). We discuss the pros and cons of retrospective and prospective approaches to RRI, considering good examples of both kinds of RRI practices in HEFRCs in Europe. The analysis is based on findings from a review of the RRI literature, with a particular focus on the governance of research and innovation processes, and interviews with 22 European-based experts on R&I governance in the area of RRI, or RRI-related topics. The article is based on the ETHNA report on state of the art and best practices (Moan et al. 2021) and is suitable as a book chapter in anthologies on ethics governance systems for RRI in Higher Education, Funding and Research Centres.

Doing right or doing good: lessons learned from retrospective and prospective RRI practices

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Abstract

In this article, we analyze the implementation of responsible research and innovation (RRI) in research and innovation (R&I) in Higher Education, Funding and Research Centres (HEFRCs). We discuss the pros and cons of retrospective and prospective approaches to RRI, considering good examples of both kinds of RRI practices in HEFRCs in Europe. The analysis is based on findings from a review of the RRI literature, with a particular focus on the governance of research and innovation processes, and interviews with 22 European-based experts on R&I governance in the area of RRI, or RRI-related topics.

Introduction

In the current landscape of HEFRCs, some RRI practices reflect a narrow, or backward-looking, conception of responsibility, while some RRI practices assume a broader, more forward-looking understanding of what responsible research and innovation entails. Put differently, the practices identified can be understood in light of different RRI-narratives with respect to what the main purpose of doing RRI should be: making R&I more *retrospective* in order to avoid future harm and thus *doing right*, or *prospective* aligning R&I with the needs and expectations of society at large, thus contributing to *doing good*, or both. In contrast to retrospective practices, prospective practices focus attention on value-laden dimensions of responsibility, asking what kind of society we want to see come out of our science and innovation practices (Owen et al. 2012, p. 756).

In this article, we will discuss the pros and cons of retrospective and prospective approaches to RRI, considering good examples of both kinds of RRI practices in HEFRCs in Europe, at the national as well as an institutional or project level. The article is based on the ETHNA report on state of the art and best practices (Moan et al. 2021). The ETHNA project aims to develop a governance structure (ETHNA, 2021) that can contribute to ensuring that

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research and innovation processes are responsible, in the sense of being ethically acceptable and socially desirable.

Method

22 semi-structured expert interviews were conducted. See table 1 for an overview of the institutions covered by the interviews, split into 26 topics. The interviewees reflected on factors that enable and/or prevent the integration of RRI, or aspects of that concept, in R&I processes. They also reflected on how enabling factors could best be integrated in a R&I governance system, and how factors that serve to prevent the integration of RRI could be expressed, or alleviated, at structural, organizational, or individual level. Interviewees were selected using a Peer Esteem Snowballing Method.

The group of informants were not chosen to be representative in terms of gender, geography, etc., but to make it possible to investigate thoughts and ideas related to a phenomenon (R&I governance in the area of RRI) in as much depth as possible, with representatives from a broad variety of positions within a range of distinct organizational structures: university, research centre/hub/strategic area, and research funding organization.

Several of the informants sits in or have participated in EU expert groups on RRI, international panels, and lead international networks. In this sense, the report investigates the phenomenon of R&I governance in RRI, illuminated by the insight of international expert stakeholders who happened to be based in Norway at the time of the interview. In some areas, the institutions are ahead conceptually and practically when it comes to integrating aspect of RRI in R&I processes.

The literature review was developed using the date bases of SCOPUS, Web of Science and Google Scholar with an initial time interval of 2011 to 2020. The preliminary search string has been “RRI”, “Responsible Research and Innovation”, “RRI AND research integrity”, “RRI AND governance”, “RRI AND public engagement”, “RRI AND science education”, “RRI AND Gender”, “RRI AND gender AND innovation”, “RRI AND open access”. Moreover, 55 EC-funded projects on RRI were screened.

Interview 1: The Norwegian Board of Technology’s (NBT) public engagement practice
Interview 2: The place of stakeholder involvement in the Norwegian Research Council’s (NRC) governance structure
Interview 3: Stakeholder involvement in Danish priority-setting for strategic research: the RESEARCH2015 project
Interview 4: Co-creation in the Public Health Alliance, Central Norway
Interview 5: Practicing ‘Hanging out’ with stakeholders in Stroud, UK
Interview 6: Community ethics committee at Harvard medical School, the USA
Interview 7: The Urban Lab neighborhood development initiative at Karlsruhe Institute of Technology, Germany
Interview 8: Platforms for transdisciplinary dialogue and cooperation under NTNU Oceans strategic area
Interview 9: The management unit for the facilitation and coordination of RRI and other cross-cutting issues in biotechnology under Digital Life Norway (DLN)
Interview 10: The facilitation and coordination of citizen science managed by the Fundación Ibercivis; a not-for-profit foundation under the University of Zaragoza, Institute for Biocomputation and Complex systems Physics
Interview 11: The discipline specific codes of conducts of the National Research Ethics Committees, Norway
Interview 12: The RRI-oriented Code of Conduct at “Applied Nanoparticles”

Interview 13: The Engaged University Steering Group and the Public Engagement Team at the research center BrisSynBio, University of Bristol, UK
Interview 14: The discipline-specific ethics committee system at the University of Twente, the Netherlands - modelled on the findings in the SIENNA project
Interview 15: The Ethics and Social Responsibility Committee at UJI
Interview 16: The Real Time assessment and anticipation platform at the research center Synbiochem at the University of Manchester, UK
Interview 17: The Ethics Management Team, Ethics advisory Board and Ethics Rapporteurs in the Human Brain Project
Interview 18: The Gender equality programme FRONT at the University of Oslo (UiO), Norway
Interview 19: The Equality Office at KTH, Sweden
Interview 20: Action plan for science education as a strategic RRI tool at the University of Bern, Germany
Interview 21: The Midstream Modulation approach at the Technical University of Delft, the Netherlands
Interview 22: The incentive structure for public communication at OsloMet, Norway
Interview 23: Focal points for action focused on different RRI keys at Universitat Autònoma de Barcelona (UAB), Spain
Interview 24: The role of change agents in the process of creating an open access infrastructure at OsloMet, Norway
Interview 25: The science Ombud at the University of Oslo, Norway
Interview 26: The role of the Office of Internal Audit at the University of Oslo's campaign to check and promote fair "Conduct, Reporting, Editing, and Publication of Scholarly Work", according to the Vancouver Recommendations

Table 1: Interviews done on best practice cases of RRI in European HEFRCs

Ethics

The study design was approved by NSD - Norwegian centre for research data. All interviews were based on informed consent by the research participants. An excerpt of the interviews is openly available on the Zenodo web platform (Zenodo 2021).

Findings

In this findings section, we will firstly point to findings from the literature review, secondly findings relating to the cases and interviews of retrospective RRI cases, and lastly to findings relating to prospective RRI cases.

Findings from the literature review

Retrospective notions of responsibility have traditionally translated into a governance of R&I practices concerned with avoiding harmful 'products' of science and innovation, with a consequent focus on risk governance. However, R&I governance processes "premised on formal risk-assessment, have done little to identify in advance many of the most profound [negative] impacts we have experienced through innovation" (Stilgoe et al 2013, p, 1569).

Retrospective accounts of responsibility are inherently limited in guiding decisions related to the trajectories of R&I, both due to the narrow concepts of risk that they assume (Felt 2007, chapter 3; Stilgoe et al. 2013), and the hierarchical, top-down, regulatory forms of governance that they seem to entail, which run counter to the unpredictable, future looking, collective enterprise of science and innovation practices .

In response to R&I governance models premised on retrospective conceptions of responsibility, "a number of multi-level, non-regulatory, forms of science and innovation governance models have taken [a] forward-looking view of responsibility ... attempt[ing] to

introduce broader ethical reflection into the scientific and innovation process ..." (Stilgoe et al. 2013, p. 1569).

It is worthwhile elaborating on what it entails in practice to introduce a forward-looking conception of responsibility as a guiding principle for R&I governance - in contrast to that of a retrospective one. Arguably it requires a fundamental shift of mindset towards acknowledging "the intrinsically normative aspects of science and technology, including risk" (Felt 2013, p. 40).

At the core of prospective conceptions of responsibility is the idea that assigning responsibility to an agent concerns, "the forward determination of what is to be done", in order either to create a desirable outcome, or to prevent an undesirable one. The focus is not on a particular wrong committed by an identifiable agent who merits blame or punishment, but on "getting the right people and institutions to work together to producing a desirable outcome or preventing a bad one" (Jonas 1984, p. 92; Cane, 2002, p.31-33).

What matters for responsibility to be generated on the forward-looking model is the combination of an outcome that is deemed valuable (be it the prevention of a harmful outcome or the facilitation of a desirable one), and institutional capacity or power to affect whether the outcome is achieved or not.

With respect to R&I governance, a prospective view of responsibility entails a shift in focus from "preoccupations with 'downstream' risk-governance", to a broader interest in the governance of profoundly political, and therefore public, concerns about what kind of society we want - and do not want -, and what kind of knowledge is required to get there (Felt 2013, p. 40).

Findings relating to retrospective RRI cases

The Norwegian Research Ethics Act (2017) gives the Norwegian higher education and research institutions a statutory responsibility for research ethics work in their organization. Most of these institutions have ethics committees in place, mandated to handle cases having to do with fraud and other forms of misconduct in research.

Norwegian national research ethics guidelines define the recognized research ethics norms in which the higher education and research institutions have a responsibility to provide training. The guidelines are discipline specific, and are managed by corresponding research ethics committees: the National Committee for Research Ethics in Science and Technology (NENT), the National Committee for Research Ethics in the Social Sciences and the Humanities (NESH); The National Committee for Medical and Health Research Ethics (NEM). Helene Ingierd, Director of the Norwegian National Research Ethics Committees, explains the function of the committees thus:

The Norwegian national research ethics committees [FEK] are responsible for making ethical guidelines at national level... They are meant to provide a framework for the ethical assessment. Definitive answers are rarely given. The purpose is to facilitate reflection. (Interview 11)

The respective guidelines place a responsibility on the institutions to include the broader societal perspective in the research ethics assessments they make; a responsibility that is already assumed in their legal obligation to provide training and education in research ethics:

It is clear that the responsibility that the law places on the institutions when it comes to research ethics is about more than dealing with cases of dishonesty; it also involves a training responsibility, which I think must be understood quite broadly in order to fulfill the requirements in the law... It is not sufficient to offer a course for PhD students, there must be continuity in the training, including for other employees, and to achieve that you must have other arenas for learning and exchange. (Interview 11)

However, despite the broader scope of the national ethics guidelines, it is not common for higher education and research institutions in Norway to take a more proactive, preventive responsibility for research ethics, which would assume a broader societal understanding of what research ethics means. The guidelines are not only directed at the institutional level, but are intended also to *“promote such reflection and awareness in the researcher”*:

The entire committee system is based on the idea that research ethics broadly understood is ultimately the responsibility of the researcher, and the committee wants to promote such reflection and awareness in the researcher, and the guidelines are also intended to do so. They are not very concrete but are meant to provide a framework for the ethical assessment. Definitive answers are rarely given. The purpose is to facilitate reflection. (Interview 11)

FEK recognizes however, that reflection on the broader, societal research ethics dilemmas should be facilitated at system level:

Although it is unclear how exactly to facilitate that kind of dialogue. We have yet to make any clear recommendations on that issue. But we see that there is a need for something else, in addition to the existing committees focusing on research fraud; a different way of discussing these issues. (Interview 11)

FEK sees that the retrospective ethics committee system may not be best placed to facilitate that kind of broader dialogue on societal ethical issues:

Different research ethics issues should be handled differently. Existing ethics committee structures may be well placed to deal with some of them. However, it is our experience that they rarely capture ethical matters that concern broader societal issues. But the national ethics committees assume that perspective in their work. (Interview 11)

At the University of Twente we find such a retrospective ethics committee system. University of Twente made research ethics assessment required for all fields as of 2020. A discipline-specific research ethics committee system has been established, consisting of four internal ethics committees: one for the social sciences, one for the engineering sciences, and one for the computer sciences. A central (fourth) committee was set up to monitor the three decentral committees. Philip Brey, University of Twente, describe the context of this committee system thus:

In a system in which scientists and engineers have had a lot of ethics training, they have a big awareness of ethical issues, in such a system you would not even need ethical committees I think because the scientists are themselves well equipped and have the relevant expertise already themselves. But that is not a situation we have now. And then a research ethics committee may be the best choice you have. You must balance it against the total situation. (Interview 14)

The ethics system is modelled on the recommendations in the SATORI project (SATORI 2021), which developed a standard for ethics committees. One important recommendation coming out of the SATORI-project was that of establishing discipline specific committees; another one was that of securing a degree of transdisciplinary in the composition of the committee members. The committees should thus have expertise in the area being assessed, as well as one from a neighbouring area, legal expertise, and should include a member from outside the organization.

The committee system is resource intensive in terms of human resources, which according to Philip Brey “cuts two ways”. The members of the committees spend time on it, they are not paid, but get slightly less teaching. And the other aspect is the researchers. If you make it a requirement, there will always be projects where there aren’t that many ethical issues, and they still must go through this process.

Importantly, therefore, the assessment process is organized into stages, to save human resources, both on the side of the committee members, and the researchers, Brey explains:

So, we have organized it such that if in the initial ethical assessment, the researcher tick ‘no’ in each box they don’t have to go through the process. If they only tick a few, only one or at most two persons will initially do the assessment; it only goes to full committee if there are complex or deep ethical issues to be discussed. In that way the process will take only a couple of weeks for everyone. (Interview 14)

The Universitat Jaume I de Castellón (UJI) in Spain also has an internal ethics committee system. The former rector of UJI initiated a process to develop the UJI’s social responsibility policy. A focus group was established with the mandate to develop a draft ethics code. The focus group consisted of university staff, students and other stakeholders, including companies that the university collaborates with.

The group drafted an ethics code that established the ethical values of the university: The Integrity and Responsible research practices Code. An ethics and social responsibility committee system was put in place to monitor and assess the implementation of the ethics code, including an ethics and social responsibility committee. The first meeting of the committee was held in September 2018.

The members of the Ethics and Social Responsibility Committee include staff, students, the general secretary of the university, the vice-rector of research, the director of UJI equality office, the director of the deontological committee (research integrity committee), as well as the ombudsperson for students. All issues related to breach of the Integrity and Responsible Research Practices Code are discussed in the committee.

A communication channel, called the ethics line, was launched in June 2018 to allow members of the staff and the students to communicate ethically problematic practices at UJI. The reports submitted via the ethics line are received by three people: the rector, the general secretary of the university, and the vice-rector. When there is a case that cannot be resolved, for instance a case that should be resolved by the deontological committee, it is forwarded to the vice-rector of research, Inmaculada Rodriguez Moya. She describes the working of the ethics line in this way:

The general secretary and I will receive this email, we discuss, and decide who we should delegate the case to, or we see that we need to consult additional people in order to resolve the case, for instance the vice rector of research or the director of equality, or the legal service at the university. They can give us advice or resolve the case for us. (Interview 15)

There is no budget set aside to manage the ethics line, and no staff, except the three persons involved in handling the inquiries received via the ethics line referred to above.

Findings relating to prospective RRI cases

In January 2020 the Norwegian Research Council's (NRC) new policy on open research came into effect. The policy addresses in a systematic, strategic way open research as well as RRI, citizens science/involvement and innovation. The focus on these topics is not new to NRC; however, the policy is a first attempt at linking all the elements and integrating them into NRC's work in a systematic way, as part of NRC's new portfolio strategy. Marte Quenlid, senior advisor on Open publication/Open science policy at NRC, describes:

In all the [NRC] boards, there are now representatives from all societal interests, different social actors, from different sectors of relevance to the various portfolios...In my opinion, involvement is something the Norwegian Research Council wants to promote; it is a way to ensure that what we do is relevant ... It is part of our governance structure. (Interview 2)

The inclusion of stakeholders had a central place in the process of developing the open science policy, and NRC reached out broadly from the very beginning of the process. Two open hearings were thus conducted as part of preparing the draft document for the new policy.

Inclusion of stakeholders is also fundamental to the way in which NRC works to realise the policy on open science. However, the attempt at linking all the elements related to responsible research to involvement is in a start-up phase, and the organisation is in a learning mode. As Erna Wenche Østrem, senior advisor at NRC, states:

We seek to have a comprehensive but diverse way of working with this. Because the target groups for research and innovation are very different, work differently and we must have different ways of dealing with it. Through this follow-up work of the policy, we are in the process of gaining a comprehensive understanding of how these things are connected. (Interview 2)

The NRC is in a process of investigating at what level, and with whom, and how inclusion will and should occur at project level. In this learning process, the NRC draws on outputs from the various projects that the organisation is part of. For instance, the EC-funded project PRO-Ethics focuses on ethically healthy pre-call consultation processes, with a view to how users and residents can be involved more systematically in pre-call consultations. The aim is to develop a check list of what are the most important questions that one should ask both at the strategic level and at the project level when it comes to this question. Knowledge from this project will be fed into the NRC's work on how best to involve stakeholders in its own work.

The involvement of stakeholders is also an important part of NRC's new organisational strategy, involving among other things a shift to portfolio management; a development which is in line with the move towards mission -thinking and involvement at the level of the EU (Mazzucato, 2019). The process of developing the NRC's portfolio plans will involve consultation rounds (2021/2022), where all relevant collaborative environments will be given the opportunity to express themselves, including the research environments. The process of creating new types of applications will also involve relevant stakeholders, in a form of pre-call consultation process.

The systematic approach to inclusion of stakeholders is also apparent in the new organisation of the NRC. As explained by Marte Quenlid, senior advisor, in all NRC boards:

there are now representatives from all societal interests, different social actors, from different sectors of relevance to the various portfolios. They are part of [the NRC's] governance structure. (Interview 2)

NRC also strongly encourages stakeholder involvement at project level as well. For example, they now have a new call for applications out where the projects are required to involve at least two social actors. In addition, there are projects where the social actors own the project, such as for instance innovation projects in the public sector. As Østrem summarised it, involvement of stakeholders at project level "is going to be a fixed size, which one has to reckon with". (Interview 2)

Prospective RRI policies are also found both in the Applied Nanoparticles spin-off company and the Human Brain research project. Applied Nanoparticles s.l. (AppNps), that is a spin-off of the Catalan Institute of Nanotechnology, the University Autònoma de Barcelona (UAB) and the Institut Català de Recerca i Estudis Avançats (ICREA). AppNps has adopted an internal Code of Conduct which defines "the principles and standards of ethical conduct that should govern the actions of the related persons in the exercise of their professional activities in their relationship with the company" (d'Andrea et. al. 2018, p. 59).

The code of conduct places principles of responsible innovation at the core of the company's mission and daily activities and processes. So, for instance, the code clearly states that activities related to products produced must be useful, sustainable and safe, and the processes leading to a product have to be collaborative and inclusive. Significantly, the content of the code of conduct is a result of a process involving the company's shareholders and staff.

Ethics and Society is at the project level one of the sub-projects of the Human Brain Project (HBP), a H2020 Flagship Project focused on neuroscience, computing and brain-related medicine. The Ethics and Society subproject aims to study the ethical and societal

implications of HBP's work and includes different kind of activities" including a "[m]ultiple approach to RRI embedment in research programs, an ethical concerns registration system, and an Ethics Management Team and Ethics Rapporteurs" (d'Andrea et al., 2018, pp. 60, 61).

Measures generally aimed at embedding RRI-related issues in the Human Brain Project include "[f]oresight studies aimed at identifying and evaluating the future impact of new knowledge and technologies generated by the HBP", the "[o]rganisation of public meetings where ethical, legal, cultural, societal, and legal issues related to HBP research are debated", and "[s]tudies on conceptual, social, ethical, and regulatory issues related to neuroscientific research and emerging neurotechnologies" (ibid p. 61).

In addition, the project has established an "ethical concerns registration system", which is "a rapid way for people to raise ethical issues and to report them to HBP .. [through] an online registration system called "POint of REgistration" (PORE), which registers the issues reported and "keep[s] track of how they are dealt with" (ibid. p.61). d'Andrea et. al. summarizes the working of the system as follows:

Requests may be submitted by any person within or outside the project, choosing to be identifiable or remaining anonymous. ... Issues may be related but not limited to the planning of experimentation or a phase of implementation. Each registered issue is reviewed by the Ethics Management Team. The team, which includes an ethics manager, decides how best to deal with the issue. The registered issue may be further directed to the Ethics Advisory Board (EAB) or SP12's Steering Committee.

The Ethics Management Team collaborates "with the ethics and society researchers and HBP management to support best research practices and in close connection with the Ethics Advisory Board (established to support the Team in implementing its functions). The team interacts with the subprojects through Ethics Rapporteurs" (ibid, p. 62).

Another example of prospective RRI is the local system that governs gender awareness at the University of Oslo, Norway. Solveig Kristensen, Vice Dean for research, emphasizes the learning potential in linking formative, dialogue research, which is intended to have a formative effect on processes, with projects that aim at developing and testing out efficient actions for organizational change:

I have no faith in working with... equality, diversity, or other complex things if the management is not heavily involved. If you have others do the job for you, the leader must go all in and support the work during the entire process. (Interview 18)

As Kristensen sees it, linking these two types of projects:

Will result in a symbiosis, where the project develops as the research provides information into it. This is what we have tried... and partly succeeded in doing in our two FRONT projects [Gender balance projects financed by the Norwegian Research Council]. The results from the research in FRONT I will provide the basis for the development of action packages in FRONT II. That is an important symbiosis. (Interview 18)

A second important factor is that they have succeeded in bringing the top-level management on board, through processes that have resulted in a cultural change towards gender mainstreaming:

Getting the management involved is about culture. This [gender awareness in job announcement] policy was discussed with all the department leaders ... They have also been part of the FRONT project since it was started, which has involved quite extensive leadership training on gender issues. Consequently, discussing gender balance issues is one of the things we do at management meetings on a regular basis. (Interview 18)

Kristensen stresses the importance of well-functioning management structures in this context:

I think that the reason why we have achieved this reasonably well is that we have worked intensely with the department leader meeting as a collegial leadership forum for the entire faculty... The frequency of meetings is also an important part of that. ..., [an equality office] can become a little isolated. (Interview 18)

And finally, the significance of working at all levels in the organization:

We started at management level, because we found that we cannot achieve anything without a good understanding at that level ... and gradually this [gender balance] became a natural part of our development and operational work. There is a leadership community [also] further down in the organization. We have been in dialogue with the management teams at each department, as well as section leaders. At the same time, we have worked with researchers, with supervision courses e.g. You must work on all levels. (Interview 18)

Kristensen says that in addition to pushing the importance of gender equality at all levels in the organization, they will now also start demanding that each department submit an annual gender equality report:

The report will be discussed by the board at the individual departments, and a summary of these reports will be discussed by the faculty board. We will use the final report in our management forums as a basis for our work on gender equality. This is also about sharing examples of best practices so that they can be reproduced. (Interview 18)

Another case is the Science Ombud at the University of Oslo. The Science Ombud was only instituted in 2019, following a long and, according to Science Ombud Knut Ruyter, complicated process. It was questioned whether a Science Ombud was needed, whether it would serve any purpose, what the mandate would be, and whether this kind of independent unit in the system would be disruptive for research. The idea of establishing a Science Ombud was to put in place a form of governance system that could monitor several

issues around research integrity, broadly understood, and not limited to preventing fraudulent behaviour.

The Science Ombud has an advisory role and shall function as a low-threshold service for researchers employed. The idea is that researchers should be able to seek out a low-level independent body within the institution, to discuss and resolve what they themselves experience as ethically problematic issues. Confidentiality is an important principle in the functioning of the Ombud, both to ensure that the Ombud institution remains low-threshold, and that those who contact the Ombud do not 'risk' anything. The Ombud can therefore not proceed with a case without the consent of the person who reports it.

The Ombud has no formal authority but has taken on a broker role. If the parties involved are willing to enter mediation they must commit to the process, including the outcome of it. The Ombud may refer cases directly to the Ethics Committee. It too has an advisory mandate only, however, the Committee sends its advice to the rector - who can decide to act on it - and in that sense has a clearer institutional connection. One problem with the ethics committee's handling of this type of cases is, in Ruyter view, that it is not public, neither the advice given nor the assessments. But this work should be transparent, so that others can learn from the cases, both at the individual level and system level. It is possible to talk openly about a case, without revealing the whistle-blower.

The cases that the Ombud handle are often about co-authorship (40% of the cases in 2019). But the mandate also includes issues related to other topics, although not as broad as the responsibility concept of RRI. The possibility of anonymous reporting is important, in Ruyter's view, the main reason being that *"whistle-blowers will very often be subject to reprisals, of one kind or another. It is risky to be a whistle-blower"*. The Ombud has solved this problem by sending notice on behalf of whistle-blowers. The case reported on has been processed in the system.

The ombudsman scheme can be extended to apply to other areas than it is now intended for. Ruyter points to the Science Ombud system Germany, with more than 700 local Science Ombud, as an example of an Ombud practice based on a broad mandate.

Discussion

Retrospective committee systems remain the dominant accountability and ethics assessment mechanism for R&I projects. The question is whether this is a suitable, and not least sufficient, governance mechanism for the purpose of integrating RRI in R&I processes. As one of our informants suggested, an ethics committee system should be understood as one among several governance instruments, which is suitable at one stage in the R&I process (the assessment stage). To ensure that attention is paid to ethics throughout the R&I process, says Philip Brey, other instruments are needed:

What I am seeing now is a shift towards paying more attention to ethics also during projects, which can be done in several ways. One is to simply to have some kind of ethics task or work-package that goes along the project, which involves ethical monitoring, ethical reflection, another way is to have this ethics by design approach, where you make ethics part of ordinary design methodology. Another instrument, more generally, is to have professional ethical codes, that also regulate the individual conduct of the individual scientist, so they don't apply to any specific project, but regulate the conduct, the integrity and the professionalism of the researchers;

another one of course is education and training. So, you ensure you have measures in place for education and training. (Interview 14)

The Norwegian ethics committee system, however, illustrates how an ethics committee that is originally built on the model of a retrospective, top-down committee system can be combined with more distributed governing mechanisms aimed at setting the rules of the game and encouraging and facilitating reflection, through disciplinary specific national guidelines, and the creation of temporary national fora for debate on issues of general interest, which raise ethical questions and dilemmas.

The Norwegian ethics committee system also may also serve to illustrate, however, the shortcomings of these committee systems, with respect to accommodating dialogue on ethical questions related to broader, societal issues. The internal committee system of the University of Twente, on the other hand, brings out nicely how a comprehensive and quite rigid ethics committee system can be set up in a way that is effective and dynamic by having stratified process criteria that make the assessment process tailored to the needs of every case.

The case of NRC illustrates how the requirement of inclusion can be met at system level by involving stakeholders in the organisation's governance structures; at the same time, the requirement of inclusion is developed as a working method for the entire organisation by drawing on knowledge generated in projects that the organisation partakes in.

The case of Applied Nanoparticles is an example of a code of conduct which arguably is in line with principles of deliberative ethics, both with respect to the process through which it was formed, and its final content. The code not only integrates principles of RRI, but the staff and other relevant stakeholders – in this case shareholders – were involved in the process of shaping the code of conduct in question, which in turn sets the rule of the game for the activities within the company. In this sense, the code is a self-regulatory mechanism of governance.

The ethics line system of UJI and the Human Brain Project are interesting, and especially the latter, because the rapport and request system works for insiders as well as outsiders. In addition, the Human Brain Project exhibits the active involvement of the public in the discussion of RRI aspects of research projects. The design of the whistleblower system at the University of Oslo points out, however, that there is more to the making of an ethical hotline than just setting up any system. There are different ways of doing this, each with its own pro's and con's, so it is important to be aware of this and do well-reflected choices to achieve the intended goal.

The gender awareness system of the University of Oslo shows the importance of working and anchoring local systems at all organizational levels, but to start at the top. It also points out that efforts of institutional change in research organization ideally should happen in a research-based way. In other words: research activity should integrate RRI-practices, but RRI-practices should also integrate research activity.

In general, one characteristic of retrospective, or backward-looking, conceptions of responsibility is that they focus attention on one-off, time-limited acts, which are undertaken in the past, by identifiable agents, with adequate control and knowledge of the

likely harmful consequences of the act (including unintended, yet reasonably foreseeable harm) (Cane, 2002; Hart, 1968; Honoré, 1999).

One problem with this focus on time-limited conduct in the pasts, is that processes, which were initiated in the past and are still ongoing, such as for instance research and innovation practices, and structures within which processes take place, such as the current, global academic incentive structure, fall outside the realm of evaluation when the question of responsibility for harm arises. Instead, backward-looking conceptions of responsibility “is premised on an understanding of harmful acts as temporary deviations from a legal and social background structure that is assumed as normal” (Young, 2007, p. 176).

The concern with time-limited harmful conduct thus also overlooks the fact that harm can be experienced, not merely as a one-off harmful incident, but as an existential reality, permeating everyday life, in a structural way. To accommodate forms of harm that are structural, and thus not timebound, we need a concept of responsibility understood as generated by “deeds already underway”, to borrow a term from Hans Jonas (Jonas, 1984, p.128) rather than as retrospectively generated by deeds already done.

A second problem with retrospective conceptions of responsibility is that responsibility arises only if a harmful outcome can be linked to an identifiable wrongdoer. As Young explains, this ‘identity condition’, implies that one isolates “the one or ones liable ... thereby distinguishing them from others, who by implication are not responsible” (2007, p.176). The identify condition is problematic also in the context of R&I practices, given the plurality of actors often involved in the knowledge production process, and the fact there is often no interaction between actors involved in the R&I process and those affected by the outcome.

Lastly, retrospective conceptions of responsibility only recognise harm that could reasonably have been foreseen. With respect to R&I processes, we do not always know what (harmful) effects in society they will have. The backward-looking model of responsibility lacks the conceptual apparatus for placing responsibility when the effect of action is unknown.

A central premise underlying the concept of forward-looking obligations is that the responsibility to act so as to produce a desirable state of affairs, or to prevent bad outcomes in the future, increases proportionally with the capacity to influence others or our surroundings, be it peoples’ rights and freedoms, society’s basic institutions, or the environment or climate (cf. Jonas, 1984, p. 93). Science and technology have the potential to influence people, society and their environment in profound ways, in both a positive and a negative sense.

Applying this understanding of a forward-looking conception of responsibility to R&I governance entails at least two presumptions about the nature of science and the relation between science and society, both of which are debatable: (i) that potentially harmful trajectories of science and innovation can be identified and stopped or changed before new technologies are ‘locked in’ to societal practices and structures (Arthur, 1989), and (ii) that the direction of science can be steered towards whatever society deems desirable.

Conclusion

In this article, we have presented and discussed some examples of retrospective and prospective RRI practices. Our discussion of these examples, in light of the RRI literature, should promote the reflection on how higher education, funding and research institutions –

the institutions that constitute the structural framework within which research and innovation take place – can carry their heavy responsibility to take the necessary institutional steps to ensure that the practices and outcomes of R&I practices are ethically acceptable and societally desirable: both doing right and doing good.

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