



## Responsible Research and Innovation: applications to the Brazilian context and its relevance to industry

Luis Reyes-Galindo

Marko Monteiro

Luciana Lenhari

Campinas, December 2020



## Table of Content

I.	An introduction to Responsible Research and Innovation.....	5
i.	RRI in a historical perspective .....	6
II.	RRI: a European approach to governance.....	7
III.	RRI policy component.....	8
ii.	The five RRI 'keys' .....	8
	<b>The Ethics key</b> .....	9
	<b>The Gender Equality and Diversity key</b> .....	10
	<b>Open access and open science key</b> .....	10
	<b>Science education</b> .....	10
	<b>Societal/public engagement</b> .....	11
iii.	RRI and organizational processes.....	11
	<b>Anticipation and reflexivity</b> .....	11
	<b>Diversity and inclusion</b> .....	12
	<b>Openness and transparency</b> .....	12
	<b>Responsiveness and Adaptation</b> .....	12
iv.	Gauging RRI's potential: organizational outlooks .....	13
	<b>Drivers and barriers</b> .....	14
	<b>Drivers for RRI</b> .....	15
	<b>Barriers for RRI</b> .....	16



IV.	Preliminary steps for an RRI case study: developing an initial understanding of a national context.....	17
v.	National context.....	17
	<b>Documentary analysis .....</b>	<b>17</b>
	<b>Engagement as research: national workshop and focus groups.....</b>	<b>18</b>
	<b>Summary of national context mapping .....</b>	<b>20</b>
	<b>The Brazilian science, technology and innovation system .....</b>	<b>21</b>
	<b>Brazilian research institutions .....</b>	<b>22</b>
	<b>Relevance of national mapping.....</b>	<b>22</b>
	<b>Regional inequalities .....</b>	<b>23</b>
	<b>Representativeness of the partner institutions.....</b>	<b>23</b>
	<b>The São Paulo research system .....</b>	<b>24</b>
V.	‘Responsibility’ in RRI-P Brazil’s institutional partners.....	24
vi.	Notes on empirical research at the partner institutions.....	24
vii.	General perspectives on responsibility .....	25
	<b>UNICAMP .....</b>	<b>25</b>
	<b>FAPESP .....</b>	<b>28</b>
VI.	Operationalizing the RRI keys.....	29
viii.	The ethics key .....	30
	<b>Ethics in the organizations.....</b>	<b>30</b>
ix.	Ethics barriers.....	30
x.	Ethics drivers .....	31
xi.	Best/bad practices.....	31



xii.	Ethics indicators .....	31
xiii.	All points of improvement.....	31
xiv.	Presentation of results .....	32
	<b>Main findings from the Brazilian case study.....</b>	<b>35</b>
VII.	RRI and industry as a final considerations.....	37



## I. An introduction to Responsible Research and Innovation

**R***esponsible Research and Innovation—or RRI—* comprises a series of actions that seek to explore how *responsibility* can be introduced into public policy and in organizational contexts that involve scientific research and technological innovation. RRI **seeks “a new relation between society, research and innovation, to better align both the process and its outcomes with the values, needs and expectations of society.”**<sup>1</sup>

Concretely, promoting responsibility is understood as the advancement of:

- a) engaged publics and responsible actors in the science and innovation field, and
- b) ethically acceptable, sustainable and socially desirable research and innovation outcomes that are aligned with societal needs and challenges.

Given the complexity of both these enterprises, **there is no unique approach to RRI, but rather a series of related practice-frameworks that focus on how to achieve these two goals in organizations devoted to research and innovation.**<sup>2</sup> Within said frameworks, the components that make up RRI can be grouped into three layers of action:

- **Academically-oriented studies** that analyze ‘real world’ applications of RRI, alongside theoretical proposals on why and how to *frame responsibility*.
- **Policy studies** which use empirical research and theoretical frameworks in considering how existing policies may be *improved by augmenting responsibility*.
- **Practitioner-oriented frameworks** that set out specific actions to probe and then *increase responsibility* in organizations.

---

<sup>1</sup> Wittrock, C., Forsberg, E.M., Pols, A., Macnaghten, P. and Ludwig, D., 2021. *Implementing Responsible Research and Innovation: Organisational and National Conditions*, Springer, pp. xi.

<sup>2</sup> See Owen, R., Macnaghten, P. and Stilgoe, J., 2012. Responsible research and innovation: From science in society to science for society, with society. *Science and Public Policy*, 39(6), pp. 751-760;



## i. RRI in a historical perspective

Historically, RRI is the outcome of programs that aim to rethink and reorganize the way science and its institutions are embedded into contemporary societies.<sup>3</sup> **The post-War** recognition of science and research as powerful institutions at State and global level, as well as the influence of science and technology in contemporary societies and cultures in the first half of the 20<sup>th</sup> century, produced concerns that started increasing in the 1960s about the need for science to directly respond to societies' exigences, e.g. to increase the public *governance* of science.<sup>4</sup> This position contrasted with pre-War idea and optimism that placed scientific institutions beyond scrutiny, based on the idea that autonomous science brought enormous benefits to society with only minor drawbacks when it was wrongly 'applied.'

The proposal to rethink science suggested orienting scientific research and technology so that they could more directly respond to societal needs, and this included the implementation of new political mechanisms to protect the public from harm as an outcome of research. This turn to a more socially reflexive science resonated with new academic movements aimed at scrutinizing the way that science was *de facto* practiced, both its 'internal' and 'external' political and social dimensions, and a drawing away from the idea of science as an impeccable, purely-rational enterprise.

**The 1970s and 1980s** consolidated both social and academic efforts in this direction. Moreover, particularly in Western democracies (viz. Europe and the USA), the second half of the 20<sup>th</sup> century also saw intense reorganizations of science and technology funding—at times enterprises deeply embedded in national public institutions and with strong government-led funding; at others with shared funding in both the public and private spheres in different degrees; to today's mixed-funding landscape.<sup>5</sup> Although this reorganization was not universal—in many parts of the developing world to this day, investment in science research still has the State as primary benefactor, and the share of investment even in developed nations is heterogeneous<sup>6</sup>—the high influence of Europe and the USA on global research agendas also meant that their regional concern for scientific governance became an important subject of discussion on how to frame global science policy.

**In the 1990s**, critical outlooks on science began to have a definitive influence on public policy as well as to permeate academia; changes which influenced the appearance of programs to directly deal with issues such as the management of scientific and technological risk; of increasing the direct participation

---

<sup>3</sup> Rip, A. 2016. The clothes of the emperor. An essay on RRI in and around Brussels. *Journal of Responsible Innovation*, 3(3), 3: 290-304; Reber, B., 2018. RRI as the inheritor of deliberative democracy and the precautionary principle. *Journal of Responsible Innovation*, 5(1), pp. 38-64.

<sup>4</sup> Kuhlmann, S., Stegmaier, P. and Konrad, K., 2019. The tentative governance of emerging science and technology—A conceptual introduction. *Research Policy*, 48(5), pp. 1091-1097.

<sup>5</sup> See Kaiser, D. (2011). The search for clean cash. *Nature*, 472(7341), pp. 30-31.

<sup>6</sup> Baskaran, A., 2017. UNESCO science report: Towards 2030. Institutions and Economies, pp. 125-127.



of publics in science policy agendas; and of dealing with injustices associated with techno-scientific disasters—yet also for increasing the uptake of science and scientific education as ‘public goods.’ Also, around this time public policy discourses on ‘science and technology’ started being reframed in terms of ‘innovation’ to capture new economic models of relating public to private interests for research development. The overarching idea of this new policymaking, harking back to those 1960s roots of a societally engaged science, was the rejection of science as an isolated cultural institution, and instead one that exhibits *responsibility* towards society in its aims and practices.

## II. RRI: a European approach to governance

**W**hile agendas aimed at reflexively reorienting the social and cultural dimensions of science and technology have been influenced by the USA’s science policy, **the creation of actual policy frameworks to carry this out is was particularly prolific in Europe.** While in the USA science, technology and education benefit immensely from public resources and are naturally shaped by State policy, it was the growth and consolidation of the European Union and its culture of aiming for common policy frameworks that produced the first efforts to tackle the governance of science as a formal goal.<sup>7</sup> Hence a number of 1990s policy documents and actions in both Continental Europe and the UK are commonly recognized as starting points for State-level discussions on the topic of scientific governance. Ultimately, this would lead to important changes in the way that science was conceptualized, organized and funded within the European Union, which would set the roots of what would later become RRI.

**In the early 2010s, RRI began consolidating ideas arising from high-societal-impact, ‘Big Science’ genomic science projects** (mainly, The Human Genome Project) for which questions of ethics and science-society interactions were very visibly brought to the fore, thanks to the immediacy of the ethical concerns raised by the HGP, and the visibility of large-scale programs that sought to directly engage the public in these ethical discussions, EU policy became oriented towards goals of more ‘upstream’ forms of scientific and technological governance, i.e. the driving idea that the impact of scientific agendas should be probed long before the science is ‘finished’ and, ought to be part of the research/innovation process itself.<sup>8</sup> These ideas were institutionalized by the EU when in 2013, the desire to tackle these issues head on became a primary research/policy component of the EU’s flagship

---

<sup>7</sup> De Saille, S., 2015. Innovating innovation policy: the emergence of ‘Responsible Research and Innovation’. *Journal of Responsible Innovation*, 2(2), pp. 152-168.

<sup>8</sup> Zwart, H., Landeweerd, L. and Van Rooij, A., 2014. Adapt or perish? Assessing the recent shift in the European research funding arena from ‘ELSA’ to ‘RRI’. *Life Sciences, Society and Solicy*, 10(1), pp. 1-19.



Horizon 2020 funding scheme. **Also, the EU simultaneously recognized that addressing the societal and ethical dimensions of research and innovation in terms of responsibility was an important component to orient research but also a topic of research in itself.**<sup>9</sup> Efforts were then dedicated to creating specific ways for defining responsibility to concretely shape policy, so that guidance could be constructed that could lead to real-world organizational action reflecting these concerns.

**It is important to remark on the European roots of RRI because, as explained above, RRI is a framework created in order to respond to historical developments and the consequent need of regulating science-society relationships in specific (European) regional social contexts.** RRI thus proposes frameworks to analyze how science and society *should* develop—according to models of European science, as seen, needed and then required by European societies. While many of these concerns can and do overlap with those of other global contexts, RRI as a strong directive for policy is a Eurocentric project. Other influential programs that reframe the ‘impact’ of science and technology in more societally-oriented ways, such as begun by the USA’s National Science Foundation in the 2010s, certainly have many overlaps with RRI, but nevertheless tend to approach actual policy actions in different ways.

### III. RRI policy component

#### ii. The five RRI ‘keys’

To recapitulate, the outcome of historical developments since the 1960s led to the institutionalization of RRI in Europe: a framework for elaborating policy on science and technological innovation, which can conceptualize and measure institutional responsibility to societal needs. Concretely, this framework intends to guide organizations and individuals in achieving responsibility through concrete and specific actions.

In its current formulation, RRI concentrates on two primary pathways for achieving responsibility. On the one hand, it offers a set of categories through which organizations can assess specific *instantiations*

---

<sup>9</sup> Owen, R., Macnaghten, P. and Stilgoe, J., 2012. Responsible research and innovation: From science in society to science for society, with society. *Science and Public Policy*, 39(6), pp.751-760.

Von Schomberg, R., 2013. A vision of responsible research and innovation. *Responsible innovation: Managing the responsible emergence of science and innovation in society*, pp. 51-74.



of responsibility, i.e. key topics through which organizations *exhibit* responsibility. These are known as the RRI 'keys', that is, a set of six practical 'degrees of freedom' for responsibility. The keys comprise primary topics which are generally agreed by the RRI community to encapsulate 'responsibility' in research-innovation *practices* in today's organizational and policy contexts.<sup>10</sup> These topics are:<sup>11</sup>

- **Ethics**
- **Gender Equality and Diversity**
- **Open Access and Open Science**
- **Science Education**
- **Societal/Public Engagement**

**The following sections summarize the essential components of these keys.**

### The Ethics key

**E**thics in RRI concentrates on three main issues:

- The integrity and reflexive assessment of research and innovation processes.
- A reflexive approach to considering the effects of scientific research as part of the innovation process.
- Involving the public's concerns into ethical discussions.

Organizations reflect ethical responsibility when they exhibit markers of concern for these topics. Concretely, these include such instruments and practices such as "ethical codes and regulations, ethical committees, research integrity training, ethics or integrity offices and officers, as well as the inclusion of ethical considerations in research and innovation projects or processes."<sup>12</sup>

---

<sup>10</sup> Several comprehensive portals for RRI are available online. The New Horizon project is an ongoing research consortium funded by the Horizon 2020 program that aims to integrate RRI into national and global research and innovation systems: <https://newhorizon.eu/> Another resource with an international perspective, used extensively as a source for this document, is the now concluded Responsible Research and Innovation in Practice project: <https://www.rri-practice.eu/>

<sup>11</sup> *Governance* is sometimes added as a separate sixth key. For a comprehensive overview aimed at implementation and a rich resource for practical application of core RRI ideas. Here we follow the conceptual and research scheme for the RRI-P project in which governance is not a separate key. Compare with the *RRI Toolkit* portal, a rich source for application-oriented RRI: <https://rri-tools.eu/>

<sup>12</sup> Witrock et al. 2020, pp. 7.



## The Gender Equality and Diversity key

**T**hough in its early formulation gender equality was the primary concern in RRI, recent developments have widened the issue to also consider 'diversity' in terms of, amongst other dimensions, cultural and ethnic background. The main issues for this key are:

- **Equal representation of all social sub-groups in research and innovation, in all research disciplines and in all hierarchical levels of organizations.**
- **The abolition of socio-cultural barriers for individuals to develop their full potential in all organizational contexts.**
- **Explicit consideration of diversity-dimensions such as gender or ethnic background in research and innovation activities and policy.**

## Open access and open science key

**O**penness here refers to the growing call for promoting the unhindered access to all aspects of research and innovation processes in their more formal, technical dimensions; and of the re-usability of information arising from research and innovation processes. This includes un-paywalled access to and exploitation of published literature and results, scientific and technical data, and in general to all outputs stemming from publicly-funded research. Additionally, two overarching aims can be identified, depending on whether openness targets inter-scientific practices, or science-society aspects:

- **To benefit scientists and researchers themselves, by encouraging practices that improve scientific communication, aid in the scrutiny and verification of research results, create scientific common goods, removes access to peer results, etc.**
- **To benefit the wider population by positing research and innovation as public goods that citizens can benefit from by more direct interaction.**

## Science education

**S**cience education **encompasses the acquisition of scientific knowledge by citizens and the population at large.** The underlying idea is that familiarity with science is paramount for enabling citizens to both appreciate and apprehend both the positive aspects of science and also



its possible complications. Science education is addressed at all levels of formal education, but within RRI is different from 'engagement' and 'outreach' activities. Science education instead focuses on how science, research and innovation are present in (or absent from) formal curricula.

### Societal/public engagement

**E**ngagement encompasses a wide range of possibilities through which research and innovation organizations may interact with wider society in a targeted fashion: from communication activities that inform the public of specific aspects of research; to exercises where publics, stakeholders and research organizations interact in a more two-way, dynamic manners; to activities that seek to involve specific publics and stakeholders in research and innovation actions. Thus, engagement can cover such diverse activities as: public conferences on research topics aimed for wider publics, cultural activities such as filmed clubs that engage publics in academic debates; continuous education programs; townhall meetings, open debates and multi-stakeholder activities focused on research and innovation topics; citizen-led initiatives on scientific issues; collaborations between research and citizen organizations; non-curricular science communication resources such as science magazines; amongst many other possibilities.

### iii. RRI and organizational processes

A salient aspect of RRI frameworks is their strong foundation on organizational studies that propose effective strategies for promoting organizational change.<sup>13</sup> In order to achieve this, **RRI makes full use of analytic concepts, categories and research frameworks that probe whether organizations have the capacity to respond to challenges posed by RRI.** This is captured in the 'process dimensions' that are the second important components of RRI in addition to the five 'keys'.<sup>14</sup>

### Anticipation and reflexivity

In developing responsibility, research and innovation are linked to uncertainties and risks associated with future developments, such as unintended consequences of scientific findings, or unforeseen

<sup>13</sup> Scott, W.R., and G.F. Davis. 2007. Organizations and organizing: Rational, natural, and open systems perspectives. Upper Saddle River: Pearson Education.

<sup>14</sup> Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. Research policy, 42(9), pp. 1568-1580.



consequences of new technologies, risk, and uncertainty. However, in its insistence on engaging wider public and social concerns into research and innovation processes, **RRI invites wider social actors to take part in the molding of scientific and technological futures from the earliest stages of their framing. Anticipation and reflexivity therefore address the capacity for organizations to ponder on the future of their actions as well as their capacity to involve other voices outside the traditional research and innovation cycles.** Besides unknown and unforeseen consequences, this also aims to bring in reflexive and potentially critical views of assumptions, activities, theories, framings, or value systems that drive research or innovation

### Diversity and inclusion

Inclusion addresses the **participation of the widest possible spectrum of social actors and stakeholders within RRI goals.** For example, in carrying out reflexive, anticipatory exercises, or in probing public concerns about new technologies, diversity would seek to include the voices of minority or marginalized groups as part of a cultural pluriverse impacted by R+I.

### Openness and transparency

While connected to the open access and open science 'key', in terms of organizational processes, **openness and transparency are also connected to the ways in which science and innovation activities link with citizens through trustworthy and honest channels and procedures.** In public institutions, in particular, the public availability of information on research budgets, of organizational assessments, the availability of freedom of information channels, and other aspects of public accountability are of high importance.

### Responsiveness and Adaptation

Given that RRI actually seeks to raise 'responsibility' as seen in organizational action, building on the capacity for organizations to respond to challenges is also an RRI goal. **Responsiveness and adaptation therefore address the mechanisms which organizations have in place to respond to both internal and external pressures, to promote and carry out institutional change, to challenge assumptions about the research and innovation process, and to re-orient institutional momentum and align to modified goals if needed.**



#### iv. Gauging RRI's potential: organizational outlooks

RRI has clear normative aspirations: underlying the framework is a formative vision of what science, technology and innovation should *ideally* look like in a healthy, democratic, inclusive society.<sup>15</sup> Nevertheless, **as an evaluative framework, RRI recognizes that probing responsibility in research and innovation across many types of organization also requires a large degree of flexibility and adaptability to all of the many kinds or organizational contexts where science, research and innovation come into play:** from small-scale public research centers, to national and international science funding agencies; from early-stage innovation startups to consolidated private sector technology players; from regional publicly funded universities in developing countries, to top-tier private colleges and research powerhouses.

Yet particularly for private industry, it may not be entirely clear how and if RRI can have an impact, as indeed RRI as originally formulated aimed to address concerns surrounding governmental and publicly funded institutions.<sup>16</sup> Then again, within RRI research it is now a well-established position that the relevance of some of its components never is, nor needs to be, homogenous across organizations. For example, comparative exercises between research funding and research performing organizations<sup>17</sup> show that, in general, the former give much less importance to engagement or education activities than the latter. Thus science funding agencies may see societal engagement in the projects they fund as a positive factor, but delegate the management of those tasks to the actual universities where research is carried out. Or, for example, funding bodies may defend a greater degree of autonomy from immediate public interests that might not be able to recognize vanguard research, while universities may have much more direct responsibility in adapting to the specific needs of the communities they serve. **The role for RRI in private organizations, taking into account this heterogeneity in 'applicability' will be addressed in later sections of this document.**

RRI should therefore not be taken as a comprehensive 'checklist' which measures, in an absolute way, whether an organization 'is responsible or not.' **Different organizations playing across different contexts in research and innovation ecosystems will find different levels of relevance in each of the keys or the organizational processes.** Then again, it is likely that issues such as ethical

<sup>15</sup> Van Oudheusden, M., 2014. Where are the politics in responsible innovation? European governance, technology assessments, and beyond. *Journal of Responsible Innovation*, 1(1), pp.67-86 and Witrock et al., op. cit.

<sup>16</sup> RRI is of course not without its critics. It has been pointed out that it can act as a framework which, through a discourse of promoting societal good, can also function as a discourse to simultaneously hide societal harm; a situation that is of particular interest in the case of private industry. For this line of criticism, see Delvenne, P. 2017. Responsible research and innovation as a travesty of technology assessment?." *Journal of Responsible Innovation*, 4(2), pp. 278-288..

<sup>17</sup> Witrock et al., Chapter 3.



responsibility, diversity and inclusion, responsiveness and adaptation and transparency cut across all organizational contexts, and in this sense RRI could prove useful as a structured way to address such concerns across many types of organizations.

In gauging the ‘relevance’ of RRI to specific organizations, the grounding on empirical organizational studies proves important: **before ‘applying’ RRI to an organizational context, it is paramount to first gain a good understanding of its inner workings, and of the socio-cultural context in which the organization operates.**

**The aspects to be considered include both formal and informal structures within the organizations.** In terms of formal aspects, this includes the normative, regulative, explicit codes and rules, bylaws, legal documents, standards, ethical guidelines, etc. that govern organizations’ inner structure; or the formal aspects that hierarchize and delegate operations within organizations (the so-called *rational systems* dimension).

Important as these formal structures are, it is equally important to understand the way in which these explicit codes actually play out (or not) in shaping organizational activities. That is, for RRI purposes, one must also consider the unwritten, cultural and social factors that mold these activities, including values, identities, conceptions, perceptions and taken-for-granted assumptions (the so-called *natural systems* dimension).

Finally, RRI recognizes that organizations are immersed in broad, socio-cultural contexts in which organizations, such as political environments, regional and country specificities, industrial national cultures, the influence and importance of stakeholders, public opinion and reputation, market conditions, external benchmarks, and other factors external to organizations (the so-called *open systems* perspective).

A full understanding of organizations across these three dimensions is critical to an efficient RRI perspective.

### Drivers and barriers

A primary reason why understanding the organizational rational, natural and open perspectives is important, is that RRI strongly advises that change should be enacted by considering both drivers and barriers to change. **That is, by identifying the most relevant characteristics of organizations, RRI attempts to identify which parts of the framework can most smoothly synergize with existing organizational aspects; and which might present particular difficulties.** For example, many organizations may not exhibit a satisfactory level of gender equality, yet might have initial programs or preliminary discussions in place to achieve such a goal. Hence, the organizational attitude towards changing gender imbalance and its open commitment to producing policies along the rational-systems axis is a clear driver for change. Conversely, the organization may be influenced by overarching



cultural values that deny or obfuscate the existence of gender imbalance, or gender imbalance may be a non-priority issue for an organization, in which case the attitude or values concerning gender imbalance is a barrier for change along the natural-systems axis.

Generally speaking, a comprehensive RRI analysis would consider how the outlook of organizations across all keys, for each of the rational, natural and open aspects, e.g.:

- ✓ Science education (rational system perspective): Does Organization X have in place a policy for promoting and improving science education in its curriculum?
- ✓ Science education (natural system perspective): Do management staff at Organization X hold scientific literacy as an important value to promote within its community?
- ✓ Science education (open system perspective): Has Organization X attempted to benefit from copious federal funding allocated to national science education programs; or is such funding limited by existing policy?

## Drivers for RRI

### **R**ational drivers for RRI include:

- Dedicated programs, infrastructures, and organizational aid directly engaging with any of the RRI keys or integrating them into a concrete set of recommended practices.
- Organizational mandates, guidelines regulations, codes, policies, or strategic documents dealing with RRI concerns.
- Evaluation and procedural criteria or incentives that cover one of the keys.
- Training activities that cover actions related to the keys.

### **C**ultural drivers include:

- Organizational values and elements of institutional identity that reflect engagement with the keys. These values need *not* depart from 'traditional' norms of science or research (e.g. objectivity, productivity, rationality, etc.), but are certainly not limited to them.
- Institutional actors that have influence within the organization and can act as 'champions' for change, or that are already committed to addressing change that is relevant to RRI.
- Positive attitudes towards aspects of RRI that are considered good 'in and of themselves' for an organization.



## **D** rivers for change from the open systems perspective include:

- National, regional and international regulations, laws and agreements that organizations sign on or must adhere to regarding any of the keys.
- National and international regulatory bodies, associations or observatories that probe or regulate RRI aspects.
- Monitoring, benchmarks, accepted metrics and other types of standardized measurements for evaluating performance that organizations adhere to or promote.
- National policies and programs that seek to address elements of the keys.
- Explicit demands from public actors, stakeholders or political organizations.
- Organizational reputation.

### **Barriers for RRI**

The kinds of barriers for RRI in organizations are often more complicated to map out than drivers, given that many of these correspond to characteristics of organizations that are not easy to correlate to specific keys. **Here will be listed some of the more salient issues identified by Witrock et al. in their comparative analysis to give an idea of what these may encompass:**

- ✓ Lack of resources, including money, time, people, training, expertise to address elements of the keys (even when they are recognized as important to achieving an organization's mission).
- ✓ Lack of incentives to achieve goals or change, often associated to lack of resources.
- ✓ Lack of formal strategies, guidelines or codes to explicitly address RRI keys.
- ✓ Little or no awareness of the importance of the keys' importance.
- ✓ Clashes between institutional values and proposed RRI actions or concepts.
- ✓ Lack of managerial support for promoting elements of the keys.
- ✓ Lack of national policies or regulation.
- ✓ Lack of public or political interest in RRI-related aspects.
- ✓ Lack of mechanisms for promoting or enforcing accountability.
- ✓ Clashes between RRI goals and private or commercial interests.

This last point is particularly significant when discussing the applicability of RRI to non-public organizations, and will be discussed in more detail further on. However, international comparative studies have highlighted tensions that may arise from the applicability of European RRI ideals to other regional or national contexts, brought about by strong differences in the way that research and innovation are framed across different cultural contexts.



## IV. Preliminary steps for an RRI case study: developing an initial understanding of a national context

**This section presents a hands-on view of how a full organizational study of RRI is carried out.** It presents a summary of the initial contextual mapping made by the Brazilian team that took part in the Horizon 2020 *Responsible Research and Innovation in Practice* project from 2016-2019, an international consortium where 12 countries and 23 institutions participated. The aim of the project was to gauge how RRI could be used to locate research-performing and research-funding organizations across different national contexts, and then to further the applicability of ‘traditional’ European RRI to these national and cultural contexts. The Brazilian organizations selected for the exercise were the State University of Campinas (UNICAMP) and the São Paulo Research Foundation (FAPESP).<sup>18</sup>

### v. National context

#### Documentary analysis

The initial stages of the RRI-P Brazil project were strongly focused on carrying out a documentary analysis of the Brazilian research and innovation context, complemented by a small number of initial interviews with important actors in relevant national institutions (e.g. the National Council for Scientific and Technological Development—*CNPQ*, the *Ministry of Science*, and *FAPESP* itself). Given the size and complexity of the set of actors involved in the Brazilian national research system, the documentary effort concentrated on three types of documents that together covered the rational, open and natural system contexts of R&I (see figure 1):

- Official national policy documents, legal frameworks, national directives, institutional regulatory frameworks. This corresponded mainly to the rational system dimension in the research protocol, but by itself would only give a general, idealized at times superficial view of the national context.
- International development and non-governmental agency reports from UNESCO, the OECD and other ST&I reports to come to grips with Brazilian science at a global scale. These illustrated the open system dimension at the international level.
- Learned society statements, manifestos and position papers, important in understanding RRI-relevant discussions such as debates on research ethics procedures at the national level, Open Access implementation, and the science funding crisis. These corresponded to the open system dimension in the Brazilian context.

---

<sup>18</sup> For the full project report, see Reyes-Galindo, L. and Monteiro, M., 2018. RRI-Practice report from national case study: Brazil, D. 13.1. The report includes a full, semi-annotated bibliography of the documentary evidence which supported the national outlook and the organizational assessment. For more information, see also the RRI-P Brazil project webpage: <https://luisreyes92.wixsite.com/unicampri>

- White papers, position papers, institutional perspective documents, such as the ‘National Conference Books’ which are similar to ‘white’ and position papers in the European national contexts. Organization books, compilations and monographs were useful to illustrate national perspectives on specific keys, for example, as well as some regional investigative or assessment reports for Sao Paulo State.
- Online material such as institutional websites, mission statements, institutional histories, organizational descriptions, internal reports, etc. Contrary to the situation faced by many of the consortium’s European partners, in Brazil institutions tend to limit publication of comprehensive institutional perspectives and analyses, statistics and program analysis beyond the most basic numerical analyses.

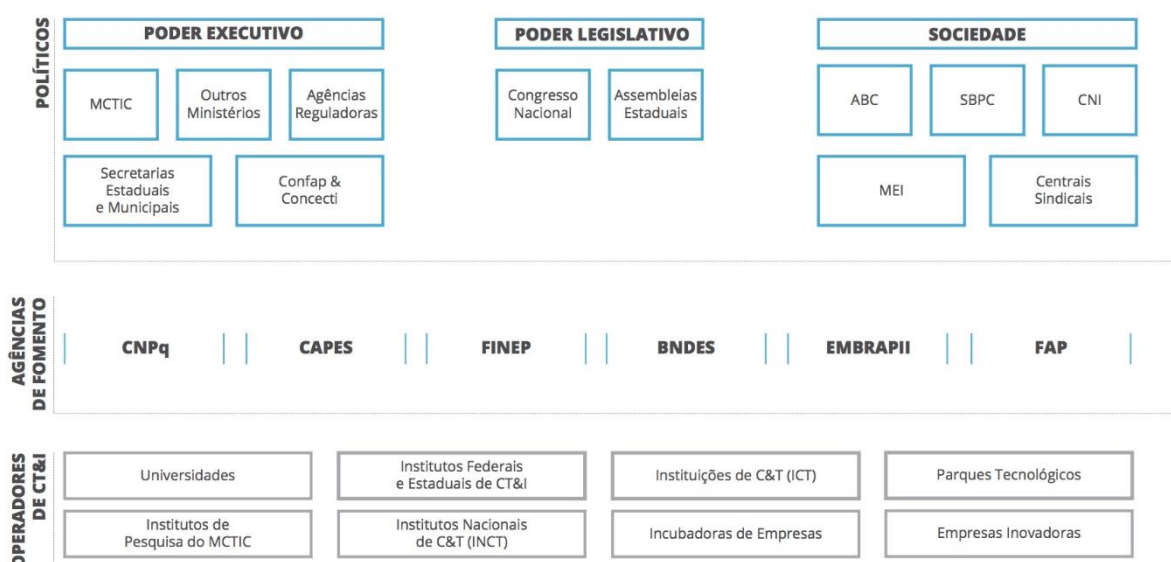


Figure 1: Figure 1: Main actors in the Brazilian ST&I system. The rational system documentation corresponds mainly to documents from the first and second rows (executive and legislative documentation); the natural system documentation to the third row (research conducting and funding institutions, local ST&I actors) as well as the, ‘society’ column in the first row (learned societies, industry agencies); the open system perspective was mainly captured through comparative international NGO studies. Source: Ministry of Science and Technology).

## Engagement as research: national workshop and focus groups

An important step to complement the documentary analysis, particularly regarding regional actors in the State of Sao Paulo, was the organization of several engagement activities that were part of the RRI-P project work packages. The first, an important mapping step, was a workshop organized at the



University of Campinas (UNICAMP).<sup>19</sup> Workshop invitations were extended to cover a wide range of stakeholders from major institutions in the Brazilian national ST&I system. Participants included academic, industry and policymaking representatives, including government ministries, federal and state funding agencies, university academics, federal institute research staff, and private sector cooperation and funding agencies. The biggest obstacle in organizing the workshop were bureaucratic practices common to many Brazilian institutions; invitations first had to be sent to the highest ranks in the organizations and only then, through them, could specific members of the organization be contacted. This, in itself, proved to be an important element regarding the possibility for 'applying' RRI to the Brazilian context.

In the end, **the most significant lack of participation came from industry, as stakeholders could not be recruited despite repeated invitations.** This disinterest from industry was in fact a topic that appeared several times during the workshop discussions and has also been identified as an important source of friction in the Brazilian R+I ecosystem. The event was nevertheless successful in its engagement aims, as most participants showed interest in both learning more about RRI, and in the possibility of organizing future events of a similar nature.

**Thus the workshop was as much a chance to complement the national mapping, as it was of creating communication bridges and connections with relevant institutions and stakeholders. These type of multi-stakeholder meetings are a common feature of RRI action-directives and most of the research consortium partners related positive workshop results.**

Another critically important research/engagement activity was the organization of focus groups at the partner institutions with the help of top management representatives who, by that time, had become familiar with the project and the findings of the institutional mapping, which they were additionally asked to read critically and comment. The focus groups started with a short presentation of the RRI project, followed by a directed discussion about participant's opinions on the draft reports, issues that had been missed, suggestions for improvement, unlisted resources, etc. Comments from participants were particularly useful in incorporating opinions from mid management perspectives and ground-level institutional views that complemented the draft reports. An updated version of the reports was sent back and minor additions were made using participant's comments.

---

<sup>19</sup> The importance of engagement with stakeholders and institutions for both carrying out the mapping and to create social links with potential research sites, as well as some nuances of the engagement activities and their relevance to the Brazilian context, is discussed in Reyes-Galindo, L., Monteiro, M. and Macnaghten, P., 2019. 'Opening up' science policy: engaging with RRI in Brazil. *Journal of Responsible Innovation*, 6(3), pp.353-360.



## Summary of national context mapping

**The national mapping was necessary to grasp the main characteristics of the Brazilian R+I ecosystem, to place it within a global context, but also to come to grips with how the partner institutions fit into this puzzle.** The heterogeneity of Brazil as a country, in addition to its size, meant that care had to be taken to understand the representativeness of the partner institutions within the ‘Brazilian national context.’ The fact that the State of Sao Paulo has perhaps the strongest R&I system—as one FAPESP manager noted, with an individual output that can rival that of many European countries—does not mean that this level of development is found across the entire Brazilian landscape. This section summarizes these findings.

**Brazil’s size and population already make direct comparison with European contexts difficult: it is the 5th largest country in the world the and 6th most populous, yet also features large disparities in population distribution and development, with high population concentrations in the Northeast and South/Southeast regions compared to the rest of the country.** The cities of São Paulo, Rio de Janeiro and Brasília are the core centers of economic, cultural and political power (respectively). The Amazonian region, around 60% of the country’s area, includes vast swathes of biodiverse protected natural areas, yet also a resource-rich target for development, and is at the heart of many disputes on global environmental responsibility. Brazil’s is the world’s 8th economy measured by GDP (PPP) and until 2010 was one of the world’s fastest growing economies, with a strong influence in South and Latin America, and a middle power/potential superpower status internationally. It has a Human Development Index (HDI) of 0.79 (high).

**Portuguese is the official language and there is a strong influence of Portuguese and European culture and of Catholic and other Christian-denomination religions as in other Latin American ex-colonies, but also a large number of indigenous and minority languages spoken throughout the country because of a rich Pre-Columbian cultural history.** Brazil is considered one of the world’s most ethnically diverse countries, as well as having one of the highest indices of racial, social and regional inequality. The World Bank estimates 3.4% of the population lives below the extreme poverty line and 19.4% under the Upper Middle-Income Class poverty line, which increased sharply after 2015, reaching particularly high indices in the peripheral regions (e.g. 45% in the North-East). Race, social class, gender, income level, religion and ethnicity are strongly intertwined into national political, cultural and social debates, which affect Brazilian society and politics from top to bottom.

**Brazil is a federal, presidential, constitutional republic with a two-chamber legislature located in the capital Brasília.** Nevertheless, an important historical and cultural marker for contemporary Brazil is the military dictatorship (1964-1985). The regime was both responsible for grave human and political rights violations including political executions and torture, while



simultaneously the country experienced the so-called 'Brazilian Miracle' period of exceptional economic growth and State infrastructural investment and planning, raising Brazil's international profile and influence.

### The Brazilian science, technology and innovation system

As of 2016, Gross Expenditure on Research and Development (GERD) totaled USD \$37,705 million (2013 PPC\$), with a GERD/GDP ratio of 1.24%, well below levels exhibited by highly-developed nations and regional leaders like China, but above the Latin American average and comparable to some Western European countries. The government's share of GERD (0.71 GDP) is high compared to highly developed nations, with the private sector providing less than half (0.53 GDP) of the contribution. Brazil has around 1.4 FTE researchers per 1000 population, which is one order of magnitude lower than leading nations like the USA, with around 54% of researchers working in higher education, 40% in the private sector and the rest in government. 61% of government R&D spending goes to higher education, with 10% of spending going to agricultural and non-oriented research each, 6% to industrial technology, 5% to infrastructure, 1% to defense, and other objectives such as environmental control, civilian space science, energy, exploration and social development capturing less than 1%. According to the most recent comprehensive government ST&I report, the main actors in the science, technology and innovation system are:

- **Executive branch:** Ministry for Science, Technology, Innovation and Communications and related Ministries; regulatory agencies such as the National Petroleum Agency, The Natural Gas and Biofuels Agency and the National Electric Energy Agency; state and municipal secretariats; CONFAP (National Council for State Research Funding Agencies) and CONSECTI (National Council for State Secretaries for ST&I Topics).
- **Legislative branch:** National Congress, State Assemblies.
- **Society:** Brazilian Academy of Sciences; Brazilian Society for the Progress of Science; National Industry Confederation; Entrepreneurial Movement for Innovation; National Association for Research and Development in Innovative Businesses; and national syndicates.
- **Funding Agencies:** National Council for Scientific and Technological Development (CNPq); Agency for Quality Assurance in Postgraduate Courses (CAPES); Funding Authority for Studies and Projects (FINEP); Brazilian Development Bank (BNDES); Brazilian Enterprise for Research and Industrial Innovation (EMBRAPII);
- **ST&I 'operators':** universities, federal and state ST&I institutes; science and technology institutions; technological parks; Ministry research institutes; national science and technology institutes; incubators; and innovation enterprises.



**Brazil's R&I system is quite young** compared to those of industrialized countries: its first modern university dates from the 1930s and it still took decades for significant investments to be made in building scientific capacity and raising technological independence, particularly during the dictatorship years (post 1964). After the 1988 constitution and its turn to democratization, Brazil underwent cycles of crisis and economic booms, directly seen to reflect on national agendas and debates on science and technology policy. Despite neoliberal reforms in 1989, investment in science and research stagnated, with the public system suffering important funding restrictions.

Through the 1990s and early 2000s raising investment in R&I to achieve more sustained growth became more central in policy. Several policies were introduced to promote innovation and improve funding mechanisms, such as the 2004 *Marco Legal da Inovação*, followed by state laws regulating cooperation between academic institutions and private companies. Important increases in science funding, coinciding also with robust economic growth characterized the following decades, a change in policy from the previous period, which was more focused on privatization and liberal principles. This lasted up to the deep political and economic crisis that followed a recession and the 2016 impeachment of president Dilma Rousseff.

### Brazilian research institutions

The institutionalization of research activities in the country began only in the 1950s, with the creation of two key funding agencies: CNPq (National Council for Scientific and Technological Development) and CAPES (Agency for Quality Assurance in Postgraduate Courses). The 1960s saw nationalistic discourse and higher education reforms aimed towards moving away from a state of 'technological dependence', while the 1970s were marked by the dictatorship-era economic boom and an incorporation of science and technology policy within the government's National Plan for Economic Development launched in 1972. The FINEP (Funding Authority for Studies and Projects) agency was created in 1971 to address the need for funding research specific to national priorities geared towards technological autonomy, and both CNPq and CAPES were instrumental in the professionalization and growth in scope and quality of the R&D system. While the 1980s were a period of contraction and increased bureaucratization, the 1990s gave way to economic openness and external competition which created a demand for "steering research toward economic and societal relevance." The creation in 1985 of a national Ministry of Science centralized federal R&D funding in parallel to the creation of regional (state) funding agencies in the 2000s, which previously had only existed in São Paulo State (FAPESP).

### Relevance of national mapping

Carrying out the mapping was not a straightforward task, which begs the practical question of why and if such an extensive research exercise is necessary. The answer is twofold. First, the preliminary and initial documentary search showed no single resource that could give a simultaneous overview of the three (rational, natural, open) perspectives consolidated into one or even a number of documents,



despite some key references providing overviews of each. But particularly because it involves many tacit dimensions or problematics that are hidden or even invisible even to actors in the R&I system, the natural dimension is hard to access only through documentary sources. In fact, comparing the rational system dimensions (e.g. institutional regulatory documents) to workshop participant or interviewee opinions often resulted in significantly different perceptions. Some examples will be discussed in the following sections.

Secondly, it soon became clear to the research team that Brazilian institutions and organizations featured characteristics that differed strongly from those in the European partner institutions, e.g. a relatively weak culture of documentation relating to institutional goals and programs addressing the RRI keys; or a general lack of comprehensive written reports on institutional accountability and performance. This could not be taken to mean that such documents were unimportant, but rather that the local organizational culture and its values had to be probed through other types of instruments and methods.

Finally, when compared to European contexts, Brazil exhibits strong differences in its social, cultural and political characteristics which directly affect RRI key aspects.

### Regional inequalities

Particularly compared to the European context, Brazil has a very large territory and total population. At the same time, there is a high level of inequality across regions, with an economically dominant South-Southeast and a comparatively very underdeveloped North-Northeast. These differences trickle down to affect the R&I system to the degree that one might as well be talking about economic differences as large as between a developed European country, and a developing Global South country. Brazilian levels of inequality are practically unknown in the highly-developed Western European context in which RRI was created.

### Representativeness of the partner institutions

While the South and South-Eastern regions that include SP State exhibit high development indices, the West-Central and North-Eastern regions are significantly less prosperous, with the Northern region having extremely low development indices. The State of São Paulo, one of the 27 territories that conforms the Brazilian Federal Republic, is the country's economic powerhouse and responsible for around 33% of the country's GDP. Its state capital has more than 20 million inhabitants and is one of the largest urban agglomerations in the world. The state is the most populous in Brazil, with around 45 million inhabitants, and also has the highest Human Development Index (HDI) and Gross Domestic Product (GDP) per capita of all Brazilian territories. It is a cultural, infrastructural, educational, scientific and industrial hub, with over 578 universities including some of Brazil's top institutions and research centers, as well as hosting major technological hubs. Indicators for R&D also exhibit these disparities, with SP State capturing 46% of the national GERD and 66% of business R&D expenditure, and its



universities producing 41% of Brazilian PhDs; 44% of all published papers having at least one author from SP; and the State receiving 86% and 73% of the country's R&D higher education funds and total public R&D funds, respectively.

### The São Paulo research system

The above disparity is importantly affected by the SP State's own and semi-autonomous scientific policy, and not exclusively by pre-existing infrastructural differences. In addition to the prosperity of São Paulo, there is a constitutionally guaranteed fixed-percentage investment of the State's tax income implemented by FAPESP, the State's funding agency, which provides for stable, federally-independent income and policy goals that can be made tailor made to fit SP's strong industrial and business communities.

The São Paulo Research Foundation (FAPESP), São Paulo State's research funding agency, is one of the main research funding organizations in Brazil and has been recognized, along with its top-rated university system, as one of the two key factors explain São Paulo's success in scientific output. It is an autonomous institution linked to the São Paulo State's Ministry for Economic Development, Science, Technology and Innovation. Funded directly from state taxes, it was initially granted a fixed 1% of the total SP State Tax Income (approximately USD\$ 300 million), in addition to federal contributions and other ancillary funds. Although this tax-percentage-based policy represents a certain stability in income even in times of economic turmoil, Brazil's current generalized crisis and a controversial measure to move FAPESP funds to other Ministry programs meant that even in SP the current recession and resulting funding crisis in science has had significant effects. In 2017, for example, movement of FAPESP funds to other ministerial programs mean that the legally mandated 1% goal was not reached. Though FAPESP plays a fundamental role in the SP state science system, it is also a thermometer and an exemplar for Brazilian science system as a whole, both in its positive and negative aspects.

## V. 'Responsibility' in RRI-P Brazil's institutional partners

### vi. Notes on empirical research at the partner institutions

**Regarding the partner institutions that were the focus of the study (FAPESP and UNICAMP) although there was also initial documentary mapping work (mostly Internet-based), the core of the empirical material comprised interviews with mid- and top-level management.** Particularly at UNICAMP we found little to no institutional written material pertaining to some keys, which in itself is an important result: given RRI's focus on the three organizational dimensions, a lack of written guidelines or regulations on the keys signifies a missing element in the kind of comprehensive organizational culture that the framework seeks to promote.



Turning to the interviews, we relied on three basic strategies to recruit interviewees: personal contacts, key informants, and directly approaching high-level aware of the project; workshop participant and existing contact with topmost-level management to both carry out initial institutional mappings were crucial for finding informants knowledgeable about specific keys. An important outcome of the workshop was understanding that middle-management and ground-level perspectives would at times be out of synch with top-management perspectives, a situation that was confirmed in various interviews:

- Two general-perspective interviews with top management at each partner institutions.
- One interview at each institution with top or mid management that was considered an expert in each specific RRI key. Each key was then supplemented with both specialist and general interviews with mid management, academic personnel, and professional working staff where appropriate. Some of these interviews covered topics a both FAPESP and UNICAMP given their strong institutional links.
- The total sample was 13 interviewees at FAPESP/UNICAMP with all but one audio-recorded, at the request of the interviewee.
- All interviews (except a single unrecorded one) were transcribed for later analysis.

The following sections will focus, first, on the overall perspective on ‘responsibility’ that characterized the partner institutions, and second, will summarize the results on key results specifically for FAPESP, as the wider-ranging partner. The full report can be consulted online.

## vii. General perspectives on responsibility

### UNICAMP

**U**NICAMP, the State University of Campinas, is one of three state-funded universities in the state of São Paulo (1992), Brazil’s richest and most populous state, stands out for its focus on post graduate education, publication and patent outputs, and often amongst the best-ranked university in Latin America. With 34,000 students it represents 12% of Brazil’s higher education enrolment. UNICAMP is a public, autonomous institution, but subject to the regulatory framework of Brazilian public institutions. Staff, including academic staff, gain entry through highly competitive civil service exams and become civil servants when hired. UNICAMP was specifically conceived to address the increasing need for qualified personnel in the interior regions of São Paulo State in the 1960s, with around 40% of total industrial capacity and 24% of the economically active population of Brazil. UNICAMP thus resonated with the stress on Brazilian technological development as a national project at that point in time.



Its general bylaws currently state that the University's missions include the creation of scientific, liberal arts, artistic, teaching and cultural personnel; stimulating research in all manner of fields; studying the community's socio-economic problematics and providing adequate solutions; placing academic output in the reach of the local community; integrating all manner of technical and social groups into the university.

Societal is a major institutional driver, primarily through building links with local technological industry, e.g. through provision of technical and scientific services and contracts such as an Innovation Agency (Inova) with links to local Campinas business and industry (many of these being themselves spinoffs from UNICAMP entrepreneurial programs). Societal engagement is also enacted through 'extension' activities, including extra-curricular classes, paid courses, services to the community and artistic events. Academic staff perform both research and teaching activities. The University receives the majority of its funds directly from the São Paulo State government: a fixed percentage of taxes. This translates into a relative independency from fluctuations in the federal government budget, an unusual advantage for Brazilian public universities.

An overarching topic that recurred during interviews was that UNICAMP is perceived to be a 'fragmented' institution, in the sense of there being an active campus where a lot of activities happen and plenty of RRI-notable programs can be carried out, but that there are few tools available for the community to organize or inform themselves and others.

#### *Aspects of responsibility in organizational policy and practice*

The concept of 'responsibility' is implicitly embedded into UNICAMP's general mission statement. These include clearly RRI-mappable concepts such as:

- **Taking part in scientific training and teaching**
- **Promoting and stimulating research**
- **Taking up and searching for solutions to the local community's needs in a democratic fashion**
- **Putting the university's academic production in the hands of the local community**
- **Integrating different social and cultural groups into the university life**
- **Promoting ethical thinking within the University's community.**

These same directives are reiterated in the University's General Rulebook.

'Responsibility' as a whole was enveloped by a discourse related to "returning to society" the resources it allocated to the university; transparency and accountability in actions; and good scientific practices promoting excellence in research. The rector has publicly framed the concept of responsibility as including the maintenance of a healthy financial outlook in a time of deep cuts and budgetary limitations, while maintaining the university's high standards. In real terms, it must temper its social mission between to financial sustainability, a right to autonomic governance, and its need to answer to public funding.



As a fragmented and complex institution, the actual application of values that encompass ‘responsibility’ are delegated to individual institutes, agencies and programs, rather than centrally enacted: there is no central ‘responsibility hub,’ although many outreach programs include ‘social responsibility’ as part of their description. We did not find nor made aware of any reports dealing specifically with ‘responsibility’. RRI as understood by the EU is widely unknown as well, despite the individual keys refer to ideas and practices sometimes well-known and established, such as ethics, gender or open access. ‘Responsibility’ is then better understood in the UNICAMP context in terms of specific goals and actions, not precisely as an institutional discourse, except as the mission of ‘answering to public good.’ The lack of ‘responsibility discourse’ can be a cultural barrier for an institutional placement of a RRI, given no strong resonance with specific, existing goals. Interviewees and participants, when questioned about responsibility, would use the more constrained notion of ‘social responsibility’, or refer to specific keys.

Culturally, we have clearly noticed that it is very difficult to start off any activity involving institutional change or impact without the existence of support from top management. The importance of autonomy in terms of researcher’s right to self-regulate their activities is a strong cultural barrier. There is also significant bureaucracy which severely limits the applicability of RRI, which could also become one more bureaucratic barrier. There was a noticeable suspicion of RRI as a form of European, ‘colonialist’ influence that would not be sensitive to either Brazilian needs nor those specific to UNICAMP. Some of the keys were also seen as only dealing with a small extension of more pressing problems in Brazil (such as the lack of a general discussion on cultural or racial diversity in RRI when discussing gender).

On the other hand, there was a positive response during the national workshop, many participants remarking that deliberative exercises involving members of the community were rare, though they could lead to rich institutional reflections. In this sense, RRI could be used as a tool for introducing a wider culture of responsibility.

Some RRI-related topics are very much embedded in the university’s missions as an ‘implicit’ form of social responsibility and in synergy with RRI. Thus, RRI could also be seen as a model to structure and organize existing programs and dialogues already part of the UNICAMP core mission. When institutional support does exist, change or policy impact can happen relatively quickly. The fact that RRI is a research-led, internationally-reaching, framework, could also be used to foster UNICAMP’s international standing. There was also awareness, particularly with researchers that have strong international careers, that being RRI-compatible is of growing importance for developing partnerships with the EU.



## FAPESP

**T**he São Paulo Research Foundation (FAPESP) is one of the main research funding organizations in Brazil and a pillar of its worldwide-recognized research and university systems. It is an autonomous institution linked to the São Paulo State's Ministry for Economic Development, Science, Technology and Innovations, created in 1962. Funded directly from state taxes, FAPESP funds research through either bursaries for undergraduate and graduate students or grants for researchers holding a PhD degree and with links to institutions in the State of SP. Other programs include: open calls for undergraduate, graduate and doctoral researchers, research grants, infrastructure development, supporting young researchers and advancing frontier topics, programs focused on applied science and innovation, public policy development, funds linking R&D cooperation between publicly and privately funded research institutions, and support for micro, small and middle-private enterprises within the State of São Paulo. Research is supported across the entire academic spectrum but emphasizing natural sciences. Proposals are judged by peer review commissions which include voluntary reviewers from Brazil and abroad. Research is judged on "scientific or technological merit, and compliancy with FAPESP's norms" by 'ad hoc' advisors who are experts in their area. FAPESP prides itself on efficient review processes, which follows clearly marked directives and assessment formularies that are signposted in its website, with around 15,000 proposals are judged each year.

### *Aspects of responsibility in organizational policy and practice*

In general, 'responsibility' is not found as such in FAPESP discourse. On the other hand, the idea of "returning to society" what society invests in the organization is compatible with RRI principles, i.e. how citizens and taxpayers are corresponded to, which makes transparency and accountability—as a public institution—an important anchor for all FAPESP-related practices. We identified two particularly important RRI-compatible institutional values: quality and accountability; both values are present in both explicit documentary form, and in the organizations' practice and value dimensions.

Quality is mentioned throughout FAPESP documentation, and often further broken down into terms like: originality, innovativeness, methodological adequacy and 'technical' scientific markers. Upper and middle management both stressed evaluation as 'bottom up' judgement in which peer review was a fundamental part of FAPESP's success in achieving quality. Also, all organizational decisions are public and processes transparent. There is a particularly strong emphasis on 'excellence,' so that all policies, actions and decisions at FAPESP become subordinated to 'scientific quality.' Assuring funding for the highest quality science is one way management enacts responsibility. Producing high quality, high impact science is the best way to make sure public investment is being well managed, and will return to society in the form of knowledge, innovation and solutions to societal problems and challenges. Quality is understood in two ways: the results of activity that conforms to common standards of accreditation by scientific peers; and quality as the result of a quantified, comparative methodology to scientific activity. An important exercise in which FAPESP and the RRI-P team found common interest was the critical assessment of quantified 'impact' as a probe for understanding the Brazilian context:



using tools such as journal impact factors, for example, was perceived by both sides as being too-narrow indicators of quality.

As FAPESP is a publicly funded organization, accountability and public transparency shape institutional practices. Accountability is a moral obligation to the public, but also a channel to prove FAPESP's worth to citizens and politicians. This includes following universally accepted notions of scientific quality-assurance; and then objectively demonstrating to institutional outsiders how outcomes, products, activities are good value-for-money to São Paulo State. FAPESP's procedures are generally regarded to be efficient and fair within and without the organization. There is openness to change if there is strong evidence it will lead to increasing the 'scientific quality' of organizational practices.

FAPESP maintains a number of indicators on program and evaluation procedures efficiency and success; periodic indicators and metrics for science and technology within SP and Brazil, but these are generally outdated. General institutional reports are published each year providing information on financial and other organizational matters. Comprehensive evaluations of specific programs and funding lines are also made publicly available. There are general financial statements online on expenses and spending, but these none that address RRI-specific keys concerns. Although the *Revista FAPESP* institutional magazine occasionally releases interesting information relevant to the RRI keys, and some of the larger programs release their own metrics, most of the easily accessible and centralised reporting is done for purposes of financial accountability. One ways to make RRI relevant to FAPESP could be to introduce more types of explicit reporting on RRI-oriented organizational results. Although producing these markers would not be a simple activity, they would bring to the foreground debates that already occur within the FAPESP community.

## VI. Operationalizing the RRI keys

This section presents a short reconstruction of how an RRI key analysis is structured using existing RRI analytic tools. The aim is to simply present a sample subset of such an analysis for a real case, using RRI methodology developed during recent years as part of ongoing efforts to widen the applicability of the framework. More information can be found on the *RRI Tools* website or the *RRI-P* project, which are two important repositories providing resources for those interested in RRI:

<https://rri-tools.eu/>

<https://www.rri-practice.eu/>



## viii. The ethics key

We will follow the general outlook used in the RRI-P project to structure the data analysis/presentation for the RRI keys. Concretely, this involves considering the following topics:

- **How is ethics defined in an organization?**
- **What are the main barriers faced in promoting ethics within the organization?**
- **What are the main drivers that facilitate promoting ethics in the organization?**
- **What are examples of best/bad ethical practices in the organization?**
- **What indicators, if they exist, are used to measure ethics results in the organization?**
- **What specific points of improvement have been found?**

### Ethics in the organizations

**The main point for defining ‘ethics’ at UNICAMP is the Ethics Committee, responsible for coordinating ethics reviews in research and developing educational programs for ethics compliance.** Given that the Committee was first developed as part of the Medicine school to adapt standards for ethical compliance in research with human subjects, the medical perspective on ethics is still foundational to the organizational definition, which also aligns to national medical ethics guidelines. **The influence of the FAPESP Code of Research ethics has also been strong, and in these both organizations share common ground, particularly since a similar document was not available at the university.**

**The FAPESP perspective on ethics is more centered on ethics as ‘research integrity’ and the avoidance of research malpractice (such as plagiarism or creating data-faking).** Ethics is tackled through three specific targets: education, prevention and just but effective punishment in cases of proven ethics violations according to comprehensive, published guidelines.

**Neither organization considers the social impact of research as an explicit ethical topic, although informally it is sometimes considered in evaluation. In fact, social impact was at times positioned as a potential attack on research autonomy or as an unnecessary bureaucratic burden that was not a desirable part of the normal research cycle.**

## ix. Ethics barriers



At UNICAMP, the lack of a formal ethics document outlining the organization's ethical outlook was a key barrier to dissemination, standardization and sanction of ethical principles. Other barriers included a resistance to intrusion in the traditional researcher space and of ethics leading to increased bureaucratization, particularly for research fields unaccustomed to ethics committees. For FAPESP, the biggest barrier consisted in the still-limited dissemination of the Code of Ethics, but administration was hopeful that an intensive education and communication program would overcome the problem.

#### x. Ethics drivers

As a top rank university, UNICAMP management was able to see RRI as a form of 'international best practices' framework that could be used as a guide for institutional conversation aimed at formally implementing ethics. FAPESP's existing code and the links between both institutions was also a strong enabler and for enforcing ethics compliance be within the organization. Awareness of the importance of ethics both in terms of research integrity and of responsibility to the public, while not institutionally formalized were present in both management and staff's minds.

#### xi. Best/bad practices

The creation of ethics committees and compliance codes at UNICAMP, as well as the promotion of the FAPESP Code of Good Scientific Practice as a model for the university were evidence of good practices. RRI's had a potential role as a gauge for tallying effectiveness in standardization of institutional practices in a global environment. For FAPESP, improving 'quality' through avoiding ethical misconduct and responsibility as a manager of public resources was an existing institutional goal. FAPESP's lead in creating an ethics code was a great milestone, as it directly influences both funded researchers and the many institutions where FAPESP funds are directed to.

#### xii. Ethics indicators

At UNICAMP, there were qualitative markers that could be institutionally drawn up to gauge present, versus future, ethics compliance, such as number of projects evaluated by ethics review boards (positive aspects); or numbers of articles retracted from journals (negative aspects). FAPESP, given its strong interest on promoting ethics, already had such markers in place. Ethics breaches and sanctions are well-documented and publicly reported as an incentive against such practices. An ethics section also features prominently in the agency's website.

#### xiii. All points of improvement.

In the case of UNICAMP, the formalization of institutional ethics was seen as an important future step, which would help materialize an existing attitude towards ethics and to consolidate structures already set in place. This would also help normalize ethics as an integral part of research. FAPESP, given its more consolidated position on ethics, could perhaps benefit from a more advanced policy of including



social impact reflections as the research processes as is currently done in the EU; or to include societal reflections as part of project goals. While this would be more in tune with RRI goals, it was also understandable that bringing in EU practices into a different cultural context could only be put forth as an invitation, and not as a breach of ‘good practices.’

#### xiv. Presentation of results

The previous section have thus summarized how a specific key can be tackled using both the theoretic and analytic tools presented in the opening sections. The following tables present a more comprehensive outlook, while interested readers can access the full report online for more information. Notice that while the analysis of organizational processes can be done separately (see full report), they are implicitly used in the Ethics key evaluation by considering how anticipation, reflexivity, openness and transparency appear in practice through institutional policies and actions. In the case of ethics, diversity and inclusion do not appear as important part of the processes, but their importance is significant in other keys.

	Structural issues	Cultural issues	Interchange related
<b>Aspects of organisations</b>	National Ethics Code (Resolução No. 466, No. 510), FAPESP Code of Good Scientific Practice.	Experience of researchers going through ethics committees, ethics board problematics, ethics cultures vary across disciplines and are unusual in Brazil.	There are national frameworks for ethics in research with human subjects and FAPESP now demands compliance to CoGP.
<b>Potential drivers for RRI</b>	Creation of Ethics Boards with dedicated committees to the Natural and the Social and Human Sciences.	Good practices and ethics are already a concern for many researchers even if no informal rules exist, growing awareness and institutionally-sanctioned education of good practices.	Pressure to conform to external guidelines, accountability to citizens as a public institution.
<b>Potential barriers to RRI</b>	Lack of an official UNICAMP ethics code.	Seeing RRI as a bureaucratic framework given the importance of personal	RRI as an external ‘colonial’ influence vs importance of



		autonomy, RRI as insensitive to the Brazilian context.	institutional autonomy.
<b>Most important potential organisational actions</b>	Create an institutional Ethics Code.	Stabilise ethics committee practices; grow community awareness of positive aspects of research ethics practices.	Communicate to outside actors the advances of ethics programs in the university.
<b>Indicators for success</b>	Have a formal code of ethics in place.	Increase efficiency and streamline ethics committee practices; put in place ethics education programs.	Increased awareness of UNICAMP as an ethics-aware institution.
<b>Potential indicator for improved performance of the dimension in the research activities/programmes [Example gender]</b>	<p><i>Formalizing and publicizing documents which codify what ethical research means for the University</i></p> <p><i>Implementation of central institutional body organising ethics review in the university</i></p> <p><i>Increase in % of projects undergoing ethics review in humanities and social sciences</i></p>		

Table 1: the Ethics Key at UNICAMP

	Structural issues	Cultural issues	Interchange related
<b>Aspects of organisations</b>	FAPESP Code of Good Scientific Practices, Portarias 05/2103, 09/2013, online documentation.	Framing of ethics as 'good scientific practices by top management' and application of principles by lower levels.	National ethics debates, international good practices from partner agencies.



<b>Potential drivers for RRI</b>	FAPESP's formulation of ethics are compatible with RRI indicators.	Growing importance of ethics discussions within Brazilian academic cultures.	FAPESP is an international agency and has followed the development of similar discussions globally.
<b>Potential barriers to RRI</b>	Scope of the meaning of ethics is narrower than RRI and there is resistance to widening this definition.	Generalised lack of awareness of following formal ethics procedures in many Brazilian academic cultures. Danger of over-bureaucratising ethics procedures.	None that we are aware of.
<b>Most important potential organisational actions</b>		Suggesting social impact reflections and anticipation as part of ethical thinking.	
<b>Indicators for success</b>			
<b>Potential indicator for improved performance of the dimension in the research activities/programs</b>	<ul style="list-style-type: none"> <li>- Support for public debates on ethical aspects of FAPESP funded research, if deemed relevant;</li> <li>- Studies of best practices and examples from leading global funders regarding the adoption of practical policies on ethical impacts and anticipation;</li> </ul> <p><i>If deemed relevant, the adoption of one or more of those practices.</i></p>		

Table 2: the Ethics Key at FAPESP



## Main findings from the Brazilian case study

The Brazilian case study showed that while RRI can certainly be relevant to contexts other than the European context, any success for this implies taking into consideration several factors:

1. Without a proper understanding of the place of Brazilian science in a global context and the advances the success that the country has reached in R+I organizations such as FAPESP, RRI could easily be perceived as a framework imposed from the outside and irrelevant or inconsiderate to local research and academic cultures.
2. However, if affinities can be drawn between local research organizational cultures and RRI objectives, it is easier to ease Brazilian organizations into considering RRI as a possible framework for change.
3. Although not all RRI objectives and targets for change will find resonance in Brazilian organizations, a significant number of them *do* synergize with existing targets for change in the institutions we reviewed.
4. The need to reflect upon institutional policy is often not part of the more formal discussions at Brazilian organizations, but rather are topics of interest for mid-management levels and downwards. Often times, reflection arise precisely because of the lack of written policy for topics that managers and practitioners already have on the radar.
5. Differences in the social and cultural characteristics of a context such as Brazil's do not necessarily negatively impact RRI objectives, but in fact can serve to revise and even recommend changes to the original framework. An important example in the RRI-P project came from Brazil and another partner, the USA, which highlighted the need to address not only gender imbalance in one key, and extend it to more general considerations of inequality: race, socio economic stratification, etc.
6. If RRI is to become influential in a context such as Brazil's, then some of the frictions between RRI and local organization's characteristics may have to be 'tolerated' by RRI and workarounds found according to local cultural norms. This was the case, for example, in navigating Brazilian bureaucracy in the same terms as Brazilians do: understanding power structures and respecting hierarchies even if they don 'make sense' to outsiders.
7. While some keys may seem particularly difficult to implement in one context (for example, societal engagement and gender balance as understood in the RRI framework were keys that proved particularly challenging to discuss at FAPESP), others at the same organization may simultaneously be characterized by excellent practices of responsibility (for example, the ethics key at FAPESP, if the societal dimension is not given the prominence it has in RRI).

To end this section, we briefly compare the Brazilian experience to that of one of the paragon sites of European RRI: the Netherlands. It has been remarked by scholars that RRI is particularly well suited to the Dutch context, in which societal/ethical concerns are intrinsic part of the policymaking system,



while at the same time economic development is an equally important component.<sup>20</sup> **In particular, three characteristics of the Dutch context, which here are compared to the Brazilian case, are recognized as roots of the affinity between Dutch policymaking and RRI (and other preceding) frameworks:**

1. **Science and innovation for public good is, and has been in the last decades, an important component of R+I policy in the Netherlands.** In contrast, while public good was seen as desirable at FAPESP, there was also an institutional suspicion of framing scientific excellence around public good. In fact, the autonomy of the scientific enterprise was mentioned by upper-level management as very important value at FAPESP and rather than an external pressure point, it was considered that responsibility came about as a result of the self-regulation of science by scientists. As mentioned previously, in this respect rather than being affine, RRI was at times viewed suspiciously as a form of ‘colonialist’ interventionism on Brazilian science.
2. **The Netherlands are characterized by high levels of inter-institutional trust and collaboration.** The Dutch innovation system features extensive participation from actors across the policy and stakeholder landscapes, including integration of both public and industry partners. In contrast, we found deep fragmentation in the Brazilian research system, including, for example, at the university level. In fact, one of the main positive outlooks that management and staff at UNICAMP could envisage was that RRI could be a tool to promote cooperation and dialogue within institutional and inter-institutional systems in which fragmentation and a lack of cooperation was the norm, rather than the status quo.
3. **Responsibility and specifically RRI are integrated into the Dutch R+I system.** While ‘responsibility’ once broken down into specific components was found to be tacitly incorporated into institutional discourses in Brazil, it was significantly different from the European notion and was never an important part of explicit discourse. RRI was generally unknown to management or staff that had not yet interacted with the research team in Brazil, and when known it was only tangentially in association with European-led projects or because of previous acquaintance with the Horizon 2020 program.

Further reflections and meta-analyses of the RRI-P project produced outcomes along these lines, albeit with some nuances, such as that there was ‘deceptively’ easy alignment between RRI principles and local contexts within settings such as the Netherlands and Australia,<sup>21</sup> though it must also be remarked

---

<sup>20</sup> Van der Molen, F., Ludwig, D., Consoli, L., & Zwart, H. (2019). Global challenges, Dutch solutions? The shape of responsibility in Dutch science and technology policies. *Journal of Responsible Innovation*, 6(3), pp. 340-345.

<sup>21</sup> Doezeema, T., Ludwig, D., Macnaghten, P., Shelley-Egan, C. and Forsberg, E.M., 2019. Translation, transduction, and transformation: expanding practices of responsibility across borders. *Journal of Responsible Innovation*, pp. 323-331.



that there were similarities between locations like Brazil and Germany in terms of the importance given to the autonomy of science.

## VII. RRI and industry as a final considerations

From the Brazilian case study and others in the RRI-P project it was found that even in contexts with strongly different to the 'ideal' Western European setting, RRI could be positioned as a driver for organizational reflectivity and change. This suggest the question of how much difference can exist so that RRI is still relevant, or how much RRI can be adapted to new contexts while still keeping to its original spirit of promoting significant organizational change for increasing responsibility.

**Besides different national and social contexts, an area of interest is whether RRI can be applied to organizations outside of the publicly-funded or governmental spheres, mainly, in the private sector. There are several reasons why transmission into this context is not straightforward:**

1. RRI's historical roots emerge from the idea of science and technology that essentially *should* respond to the large-scale needs of the societies into which they are embedded. Science in this projection is essentially a public good and as such implies responding to the widest possible publics. However, private industry does not, in general, respond to the needs of the widest possible publics but rather to its own internally-defined goals. While this may overlap with the public's, they remain essentially separate. As Martinuzzi et al. point out, despite of and social welfare having been implemented in industry, these have only been partially fulfilled and are not considered part of business 'DNA.'<sup>22</sup>
2. When there are clear clashes between organizational goals and the public good, RRI posits that the onus is on organizations to enact change and to align to societal needs. In the case of private organizations, as long as no direct harm is produced for the public, there need not be any incentive for institutional goals to align with society's if this goes against the organization's internal logic.

It must be strongly emphasized that RRI is a framework that addresses reflexive, deep changes in organizational actions, cultures and values, and not simply aligning a set of actions or documents that show 'compliance' with RRI. This was an issue that came up several times during the RRI-P project and particularly in Brazil. For example, during some of the workshops, when managers were invited to give short presentations on how RRI might be relevant to their organizations, many of the presenters

---

<sup>22</sup> Martinuzzi, A., Blok, V., Brem, A., Stahl, B. and Schönherr, N., 2018. Responsible research and innovation in industry—Challenges, insights and perspectives, *Sustainability*, 10(3), p. 702.



concentrated on showing documents or statistics that showed how their organizations were already, successfully, ‘applying’ RRI.

**The goal of RRI is not to ‘certify’ that an organization is being responsible. In fact, for an organization which sees itself as already fulfilling all responsibility-goals—to take the extreme example—RRI has *no* useful facets. Yet neither is it useful, as some organizations also did during the workshop, to pick particular points in which RRI has been successfully ‘applied’ and to disregard other points without serious consideration. Again, it must be pointed out that RRI, both conceptually and also instrumentally, is a framework for initiating reflexivity on organizational practices. It may be that, indeed, some keys or concepts in RRI do not apply to an organization, but this has to be taken as a reflexive exercise in itself and part of a deeper mapping of practices, values and cultures within.**

Organizational scholarship suggests that despite these barriers, responsibility is neither absent in industry, nor is its version of ‘responsibility’ incompatible with RRI goals. Nevertheless, the availability of scholarly resources looking specifically at RRI in industry or of real-world case studies looking at ‘applications’ and impact of RRI—at least RRI in the deeper sense used in the previously discussed projects—is still quite limited.<sup>23</sup>

**Gurzawska et al. (2017), for example, point out that the concept of corporate social responsibility (CSR) and RRI have many overlaps, even if they also share significant differences.**<sup>24</sup> Gurzawska and al. argue that while RRI is a top-down regulatory approach, CSR works as bottom-up self-regulation for facing external constraints such as international laws and regulations. In this potential overlap, Gurzawska et al. put forth a set of incentives for industry that could be lured into RRI. However, the study admits that being driven by neoclassical management principles based on companies maximizing profits and customers maximizing utility.

The idea then is that if RRI can be shown to lead to increases in profit, for example by improving a company’s reputation amongst its customers, then RRI will be an incentive for change. As interesting

---

<sup>23</sup> The Responsible Industry project (<http://www.responsible-industry.eu/>) is an industry-oriented analogue to the projects cited above. It produced preliminary considerations, academic literature and case study empirical material for thinking on the possible pathways for RRI implementation in industry. Some of the material produced could prove interesting for business executives, but a pragmatic and utilitarian view of RRI that is at times very much at odds with the view of RRI presented here is the dominating discourse. See, however, the four case studies of application (<http://www.responsible-industry.eu/activities/bu-casestudies-results>) for examples of how RRI can indeed function across different conceptual/pragmatic dimensions: from product development that includes customers in the early stages of product development, to planning infrastructure projects with citizen perspectives as an organizing element.

<sup>24</sup> Gurzawska, A., Mäkinen, M. and Brey, P., 2017. Implementation of Responsible Research and Innovation (RRI) practices in industry: Providing the right incentives. *Sustainability*, 9(10), p.1759.



as this idea may be, and indeed useful as it may be in raising interest in RRI even beyond industry, it raises the question of what will happen when and if RRI, or certain aspects of RRI, does not maximize but rather lower profits. Such utilitarian cherry-picking is ultimately incompatible with a foundational, normative aspect of RRI: that organizations have the *obligation* to respond to societal needs. Careful use must be made, though it can legitimately be made, of using an RRI-as-certification discourse.

In the Brazilian case study, for example, UNICAMP management was aware that following RRI principles would add to its image as a world-class university that complies with international good practices, but it was important to chain that to the idea that it was ultimately not the reputation that was the foremost driver, but the benefits that the university community and the wider public would gain from organizational change. Gurzawska et al. also point to two external pressures for change: legislation and customer pressure. On the first, RRI recognizes the importance of such instruments for increasing responsibility. The authors also report, however, that many of the organizations reviewed in their study considered the application of RRI guidelines as surpassing the reach of legal frameworks, and this was a source of difficulty. Customer pressure comes from 'critical consumerism' and the positive aspect of certification outlined above. Indeed, stakeholder and public pressure are factors considered by RRI as drivers for change, but this also comes into tension with the utilitarian attitude of seeing customers (who in the end, drive profit) as the main benefactors of organizational change.

More in tune with the idea of RRI as a pure assessment or organizing tool, Flipse et al.<sup>25</sup> have created instruments to orient RRI as a means "to pinpoint what should be done to carry out a project as good, and ethically as possible." Other studies,<sup>26</sup> which again have greater nuance about the ethical and societal dimension of RRI than the purely pragmatic views, stress that adopting responsibility framings in early stage academic spinoffs can specifically target and positively influence the anticipatory capabilities of early-stage industry both in raising status but also in exhibiting societal and ethical responsibility. As in 'translating' RRI to non-European national contexts as suggested by the RRI-P outcomes, research suggests<sup>27</sup> that a similar translation (and not simply a pragmatic 'adaptation') of RRI to industry is necessary for it to become relevant to industry non-traditional application sites, yet without losing sight of the societal/ethical aspects that are at the heart of RRI's original purposes.

---

<sup>25</sup> Flipse, S.M., Van Dam, K.H., Stragier, J., Oude Vrielink, T.J.C. and Van der Sanden, M.C., 2015. Operationalizing responsible research & innovation in industry through decision support in innovation practice. *Journal on chain and network science*, 15(2), pp.135-146.

<sup>26</sup> Scholten, V.E. and van der Duin, P.A., 2015. Responsible innovation among academic spin-offs: How responsible practices help developing absorptive capacity. *Journal on chain and network science*, 15(2), pp.165-179.

<sup>27</sup> van de Poel, I., Asveld, L., Flipse, S., Klaassen, P., Kwee, Z., Maia, M., Mantovani, E., Nathan, C., Porcari, A. and Yaghmaei, E., 2020. Learning to do responsible innovation in industry: six lessons. *Journal of Responsible Innovation*, pp. 1-11.