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RESPONSIBLE RESEARCH AND INNOVATION

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ABSTRACT

This paper explores existing literature on Responsible Research and Innovation (RRI) and Responsible Innovation (RI). As part of this paper, we explore the conceptual dimensions of RRI/RI as presented and discussed in a wide variety of works. This paper looks at the main features and characteristics of RRI and RI, and finds out how these two discourses are being framed in the literature, policy and practical applications. The paper also explores how RRI and RI are distinct from each other.

KEYWORDS: Responsible Research, Responsible Innovation, Innovation Governance Framework, Emerging Technologies, Anticipatory Framework, Science Policy

Emerging technologies are technologies whose practical applications and development are still getting evolved. These technologies are characterized by unique and complex challenges, diverse applications, necessitating the need for new governance approaches (Marchant et. al, 2013). In general, the risks posed by emerging technologies extend beyond traditional issues related to environment, health, and safety and are characterized by a degree of uncertainty related to potential impacts.

Responsible Research and Innovation (RRI) and Responsible Innovation (RI) are overlapping concepts that are gaining prominence in the context of emerging technologies. RRI/RI aim to provide an innovation governance framework for emerging technologies and innovations which aim to steer science and technological innovations towards outcomes that are beneficial and desirable for the society. RRI/RI shares conceptual similarities and includes elements of risk governance, anticipatory governance and sustainability governance. At the same time, RRI/RI is envisioned to encompass the innovation process and product in its entirety. As such the scope of RRI/RI is wider than the other related concepts.

In the context of governance of emerging technologies, the concepts of Responsible Research and Innovation (RRI) and Responsible Innovation (RI) have been gaining increased attention. RRI/RI discourse consists of different framings. One way in which RRI/RI has been framed as guiding framework for science policy so that the research and innovation processes and the outcomes have beneficial impacts on the environment and society. The common theme in all the conceptualizations and framings of RRI/RI is that the outcomes of scientific research, technology and innovations should mitigate social, ethical and environmental risks, and have desirable impact on the society.

RRI discourse at present is predominantly used in the context of science policy, and has not seen many applications in other contexts. RI as a governance framework is not a well-defined and fixed structure. RRI is supposed to include a plurality of ideas and practices, rooted in different contexts. RI prompts us to consider not only the consequences but also the "very purpose" of innovations (Owen et al. 2013). In the subsequent paragraphs, we explore the concept of RRI/RI in greater detail and find out how the concept is getting framed in literature.

Though much is talked about RRI/RI as providing new ways of governing technological innovations, it is still unclear as to what are the foundational and guiding principles of RRI/RI. This chapter attempts to provide and extensive and in-depth literature review of the conceptual dimensions and principles behind RI/RRI.

DEFINING RRI/RI

The discourse of RRI/RI is still in infancy and getting developed. As such, the literature pertaining to responsible innovation is rapidly expanding, and there is no dearth of definitions. A few scholars (Von Schomberg , 2011; Sutcliffe, 2011) have played an important role in laying the early foundations of RRI.

In the literature regarding RRI/RI, the definition of RRI given by Schomberg is very commonly cited, "Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society) (Von Schomberg, 2013, p. 63)".

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Another popular definition of RRI/RI is given by Owen et al. (2013), “Responsible innovation is a collective commitment of care for the future through responsive stewardship of science and innovation in the present. (p.36)".

Sutcliffe (2011) explains the concept of RI to include the following components:

1. The deliberate focus of research and the products of innovation to achieve a social or environmental benefit.

2. The consistent, ongoing involvement of society, from beginning to end of the innovation process, including the public & non-governmental groups.

3. Assessing and effectively prioritising social, ethical and environmental impacts, risks and opportunities both now and in the future, alongside the technical and commercial.

4. Where oversight mechanisms are better able to anticipate and manage problems and opportunities and which are able to adapt and respond quickly to changing knowledge and circumstances.

5. Where openness and transparency are an integral component of the research and innovation process” (p.3).

According to Stahl (2013), RRI is a meta-responsibility to ensure desirable and acceptable research outcomes. According to Geogheghan- Quinn (2012), RRI/RI aligns an innovation product or process with the expectations of European society.

Rip (2014) has opined that RRI/RI is a kind of social innovation, where the roles and responsibilities of the stakeholders are shared. The common characteristic in all definitions and conceptualizations is that RRI aims to ensure beneficent outcomes of research and innovation.

Some of the key aspects of RRI/RI conceptualizations that have been discussed in the literature are Social innovation, Meta responsibility, Expectations of the European society, Collective and shared responsibility, Openness and Transparency, Ethical acceptability, sustainability and societal desirability. To summarize, RI is a meta-responsibility aimed at ensuring outcomes that are not harmful for the planet and society, solve society's problems, and have desirable impacts and consequences.

Table 1: Various definitions of RRI/RI

Author	RI aspects
Von Schomberg (2013)	Ethical acceptability, sustainability and societal desirability
Sutcliffe (2011)	Openness and Transparency Oversight mechanisms
Stilgoe et. al (2013)	Collective and shared responsibility
Geogheghan- Quinn (2012)	Expectations of the European society.
Stahl (2015)	Meta responsibility
Rip (2014)	Social innovation.

RRI/RI: Origin and Evolution

In order to place RRI/RI in the proper context and understand its relevance, it is important to be acquainted with its origin and linkages with other concepts. In the following paragraphs, the origin and evolution of the concept of RRI/RI is briefly discussed. An early precursor of RRI/RI can be said to be the term ‘responsible research’. The term was first used by the European Commission in 2002 in the Sixth Framework Program in 2002. Another similar concept was “responsible development”, which was used as a strategy to deal with the risks associated with nanotechnology in the USA (A new Approach of ethics in Science, 2013). In 2012, RRI was adopted as a formal initiative of the European Commission (EC). At present, both RRI and RI are umbrella terms, which include a variety of ideas, policies and practices. The RRI discourse at present is structured around EC policy's five thematic keys that guide its funding

CONCLUSION

This paper reviewed the concept of Responsible research and Innovation and Responsible Innovation. Some of the key aspects of RRI/RI conceptualizations that have been discussed in the literature are Social innovation, Meta responsibility, Expectations of the European society, Collective and shared responsibility, Openness and Transparency, Ethical acceptability, sustainability and societal desirability. At present, both RRI and RI are umbrella terms, which include a variety of ideas, policies and practices. The RRI discourse at present is structured around EC policy's five thematic keys that guide its funding. In contrast, Responsible

Innovation (RI) is mainly an academic discourse, mainly prevalent in business studies.

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