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RESPONSIBLE RESEARCH AND INNOVATION

Abstract

Responsible Research and Innovation (RRI) represents a paradigm shift in how to approach technological development and scientific inquiry. It focuses on guiding innovation processes toward societally desirable outcomes, specifically in response to global issues like climate change and food security. RRI advocates for a shared responsibility among various stakeholders including innovators, policymakers, and civil society. Originating in EU research programs, RRI has gained international influence, reflecting an evolution from earlier frameworks that prioritized societal and ethical considerations in science and technology. However, RRI faces challenges in implementation, often falling short of its transformative potential, requiring ongoing reform to truly align innovation with societal needs.

Keywords: Responsible Research and Innovation (RRI); Responsible Innovation (RI); science and technology; ethics of technology; innovation governance

Outline of the Topic

The concept of Responsible Research and Innovation (RRI) represents a paradigm shift in how to approach technological development and scientific inquiry. It stems from the recognition that science and technology have profound impacts on society, thus instilling an ethical imperative to ensure that these impacts are positive and contribute to a better future. Frameworks of RRI have gained traction in both academic and policy circles, with particular relevance in fields such as biotechnology, artificial intelligence, nanotechnology, and environmental science. Though these frameworks may vary, there is a broad consensus among scholars about the need for a form of governance that steers research and innovation towards societally desirable outcomes. Such governance involves fostering a sense of shared responsibility and mutual responsiveness among a wide range of actors, including innovators, policymakers, industry representatives, and civil society groups.

Conceptual Overview and Discussion

RRI has gained increasing significance over the years, evolving from its introduction as a cross-cutting issue in *Horizon 2020* (2014–2020), the European Union's (EU) Framework Programme for Research and Innovation, to now being an operational objective of the strategic plan for *Horizon Europe* (2021–2027), the latest EU Framework Programme for Research and Innovation. This concept has also occupied a central place in national research councils – notably in the United Kingdom, Norway, and the Netherlands – to launch their own initiatives to promote RRI. In addition, RRI has gained global recognition, extending its influence on countries like the United States and China, where it has been integrated into their respective national plans for science, technology, and innovation.

Although RRI as a concept was developed ten years ago, attempts to institutionalize ethical and social dimensions of science and technology trace back to the late 1960s when risk identification and analysis first gained prominence. This movement gained momentum in the early 1970s, particularly in response to the challenge of nuclear waste disposal, which prompted initiatives towards nuclear disarmament. In the 1990s, public debates surrounding issues such as genetically modified organisms and nanotechnology in food products also brought the ethical dimensions of science and technology into focus. As a result, in early 2000, the European Commission adopted a Communication on the use of the precautionary principle, emphasizing the importance of informing the public and policymakers about known risks and areas of uncertainty. This reinforced various approaches and frameworks to govern science and technology, integrating ethical and social considerations. These included Technology Assessment (TA), Science and Technology Studies (STS), and research on Ethical, Legal, and Social implications (ELSI) or Aspects (ELSA) of emerging technologies.

RRI builds upon its predecessors but emerges as a reform in several ways. Firstly, it specifically steers research and innovation towards addressing 'grand challenges' such as climate change, water scarcity, loss of biodiversity, and food security. In doing so, RRI shifts from traditional evaluative assessments of emerging technologies to an approach founded on collective responsibility among stakeholders. This approach is underpinned by an ethics of construction, in contrast to an ethics of constraints, emphasizing not only what innovation outcomes should be prevented but also what outcomes should actively be pursued. Moreover, by focusing on the innovation process, RRI advocates for the inclusion and commitment of all stakeholders to make the outcomes of innovation more manageable and purposeful. Operating under the principle of science with and for society, it posits that research and innovation can only meet the needs and aspirations of society if all actors participate throughout the entire process. Finally, RRI exceeds conventional economic incentives and addresses market failures to ensure that innovation processes genuinely yield societally desirable outcomes.

Application

One example of how RRI can be put into action is through the concept of Open Science. Open Science advocates for research to embrace principles of transparency, inclusivity, and interdisciplinary collaboration. It promotes the early sharing of knowledge and data in collaborative partnerships. In addition to granting open access to data and publications, this emphasizes the importance of ensuring accessibility and responsiveness among all participants in research and innovation systems. Open Science involves engaging a wide range of actors in the co-production of knowledge, extending beyond the traditional academic realm to include collaborations with citizens and non-experts. It serves as a catalyst for change, influencing behaviors and practices, and prompting reforms in the reward and incentive systems within research organizations. These reforms, exemplified by initiatives like the Open Science Policy Platform, challenge established norms and practices within institutions like universities. Open Science advocates for the recognition and reward of not only the quantity and quality of research publications but also diverse research behaviors and practices that promote open and collaborative knowledge co-creation.

Another example of implementing RRI involves the design and set-up of social labs. These labs act as collaborative hubs, bringing together a diverse array of stakeholders, including academia, businesses, research institutions, funding organizations, policymakers, civil society,

and the general public. They provide a flexible, experimental space free from rigid project plans and expectations. Social labs are unique in their capacity to foster co-creation within a practical, real-life context, enabling participants to collectively address societal challenges. For instance, the *NewHoRRIzon* project, funded by *Horizon 2020*, established nineteen social labs, each dedicated to a specific challenge. These labs ensured consistent and ongoing engagement of a variety of stakeholders, effectively enabling public engagement and putting RRI into practice. The implementation of social labs reflects the transformed relationship between science and society envisioned by RRI, where both innovators and societal actors are empowered to contribute to research agendas and voice their perspectives throughout the entire innovation process, from beginning to end.

Critical Summary

While RRI offers a compelling vision for more ethically grounded and socially responsive research and innovation, its implementation faces challenges. The tension between normative ideals and practical implementation remains a significant hurdle. The integration of RRI into existing research and innovation systems often falls short of its ambitious goals, as it can be instrumentalized to meet funders' requirements without driving meaningful change. Additionally, there is a risk of greenwashing-like practices where RRI is used to rebrand existing structures and activities without substantial reform. Finally, there is a need to address the politics of innovation, including questions about democratizing the innovation process, the inclusion of marginalized voices, and the distribution of power. These issues call for ongoing reflection and reform to ensure that RRI achieves its full potential in steering research and innovation toward more responsible and socially beneficial outcomes.

Further Readings

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