Routledge
Taylor & Francis Group

Journal of Responsible Innovation

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tjri20

Participatory design: lessons and directions for responsible research and innovation

Carolyn Ten Holter

To cite this article: Carolyn Ten Holter (2022) Participatory design: lessons and directions for responsible research and innovation, Journal of Responsible Innovation, 9:2, 275-290, DOI: 10.1080/23299460.2022.2041801

To link to this article: https://doi.org/10.1080/23299460.2022.2041801

Published online: 28 Mar 2022.

JOURNAL OF RESPONSIBLE INNOVATION
2022, VOL. 9, NO. 2, 275–290
https://doi.org/10.1080/23299460.2022.2041801

Routledge
Taylor & Francis Group

DISCUSSION PAPERS

Participatory design: lessons and directions for responsible research and innovation

Carolyn Ten Holter

Department of Computer Science, University of Oxford, Oxford, UK

ABSTRACT

This review compares and discusses the literature and practice of participatory design (PD) and responsible research and innovation (RRI) to discover commonalities and contrast their approaches to similar challenges found in such 'participatory' methods. It seeks to gain insights from the older practice of PD and attempts to discover whether there are lessons that RRI could usefully draw on to address its own challenges. The paper suggests that PD's understandings of the politics and power dynamics surrounding inclusive methods; its democratisation imperative; and its nascent development of project documentation may offer useful considerations for RRI. The paper concludes with some concrete suggestions for RRI as it continues to develop and be operationalised.

ARTICLE HISTORY
Received 22 January 2021
Accepted 9 February 2022

KEYWORDS
Responsible innovation; participatory design; reflection; anticipation

Introduction

Responsible research and innovation (RRI) is becoming increasingly embedded in many European and UK institutions (de Saille 2015) – for example, the mandatory inclusion of RRI in the training provided for doctoral students by the current generation of Centres for Doctoral Training in the UK (UK Research and Innovation 2018). As RRI becomes more institutionalised (Owen et al. 2021), there is an opportunity to reflect on possibly useful comparisons with a practice that presents similar concerns to those that may challenge RRI.

Participatory design (PD) has been selected for this comparative exercise for two reasons. First, because PD and RRI share common ground in being centred on *inclusivity* – the act of deliberately including those who would normally be outside a development process to improve the outcomes of that process – and second, because PD would appear to have been little-considered in the literature around the development of RRI. Although RRI is frequently discussed as a possible successor to practices such as technology assessment (TA) (Grunwald 2011; von Schomberg 2012) or related to work on corporate social responsibility (Stahl et al. 2019), there is a paucity of work that examines it relative to PD. This paper, therefore, seeks to compare and contrast PD and RRI and acknowledge PD as a valuable and important contributor to RRI – particularly as it is understood in the UK

CONTACT Carolyn Ten Holter carolyn.ten.holter@cs.ox.ac.uk

(per Stilgoe, Owen, and Macnaghten 2013) – to draw out possible lessons for RRI and suggest avenues for future research.

The paper examines the literature of both RRI and PD to investigate the motivations that have driven their development before discussing key features of both in more detail, examining their different approaches to similar challenges through the use of two case studies, and concluding with possible insights that RRI could integrate from PD and recommendations for future investigation.

Methodology

PD and RRI have large literatures, both theoretical and empirical in nature. For this paper, it was neither practical nor necessary to review the majority of these literatures. Searches for papers addressing overlaps between PD and RRI were undertaken from Google Scholar and Web of Science, returning no relevant results. It was, therefore, necessary to establish a set of papers on which to draw for the analysis.

In the case of PD, the literature is of several decades' standing – therefore, to provide a starting point, the ACM-ToCHI *Special Issue on Reimagining Participatory Design* (Bannon, Bardzell, and Bødker 2018b) was settled on as a touchpoint for initial review, with relevant contributory literature also drawn in, particularly, where this directly addressed the key challenges identified as possible overlaps between PD and RRI.

For RRI, the seminal papers from Owen, Macnaghten, and Stilgoe (2012), Stilgoe, Owen, and Macnaghten (2013), and von Schomberg (2013) were used as a starting point. The Connected Papers tool[1] (which is based on the SemanticScholar database and provides linked-data visualisations of prior and successive papers) was utilised to source related papers, chaining both backwards and forwards to find work that similarly addressed the common key challenges or points between PD and RRI.

Both sets of papers were scanned initially for such areas of commonality – as such areas became apparent, those papers were read in closer detail, annotated, and themes drawn out for analysis and deeper investigation.

Background

Novel technologies that can impact society need to be accepted if they are to become successfully embedded – societal trust is, therefore, essential to the process of acceptance. The importance of such trust has been seen (for example) in the rollout of 5G networks, that have become the targets of conspiracy theories and attacks (Hern 2020). Once trust has been lost in a particular technology, it may be enormously difficult to regain – in the 1950s and 1960s, public attitudes to nuclear power were almost entirely positive, but repeated scandals, accidents and errors led to deep mistrust (Dalquist 2004). Many societies are now extremely sceptical of the value of nuclear power, despite the possibilities it presents for reducing reliance on fossil fuels (Abdulla et al. 2019). The rollout of genetically modified organisms is also frequently cited (Burke 2004) as an example of where public failure of trust resulted in widespread public rejection of the technology. These examples demonstrate that innovations and novel technologies may come either from private companies or public sector bodies, but in both cases, if public acceptance is not achieved, there is likely to be societal pushback or rejection. This damages the relationship between

scientific innovation and society and causes societal questioning not just of the technology itself, but of the scientific establishment. This has implications both for trust in and acceptance of these technologies, but also for the ongoing relationship of society with the science and innovation ecosystem that creates and/or promotes such technologies.

The importance of this trust-relationship and the need to align scientific development with social values (eg Fisher et al. 2015) is now widely recognised at policy level, and formed a cornerstone of the EU's 'science with and for society' (SWAFS) theme, expressed partly through the Horizon 2020 programme (European Commission 2020). In the UK, this line of reasoning is also highlighted in the *Science and Society* report (House of Lords Science & Technology Select Committee 2000), which is regarded as a landmark in the attempt to improve science-societal relationships (per Genus and Stirling 2018).

Both PD and RRI represent attempts to improve the science-society relationship, at least in part through inclusivity. The importance of the 'inclusive' approach, central to the concept of *participatory* design but also seen in the *stakeholder-inclusion* element of RRI, is that it aims to build a bridge between innovators and publics. The objective is to create an improved 'fit' between the design or development and the societal context within which it is to be embedded. This is to be achieved through two separate but linked objectives: (i) to try and ensure that possible negative effects are foreseen and where possible ameliorated, and (ii) to provide democratic legitimacy to innovations.

Democratic legitimacy and minimisation of negative impacts are seen as crucial by developers, companies, and governments, because part of societal trust and acceptance will depend on innovations being well-aligned with societal requirements. This applies both in a product and a process sense – this may mean not just creating innovations that society needs, but carrying out innovation in a way that enables the public to have confidence in the methods used (Brouneus, Lindholm, and Bohlin 2019). Publics need to be able to have confidence and trust in both process and product because technology affects society – and sometimes, these effects are not positive. Negative effects can rapidly undermine public trust.

A frequent explanation for public mistrust or lack of acceptance of scientific innovations has been that publics *fail to understand* – the so-called 'deficit' model. This model has been repeatedly criticised, with Wynne (2006) in particular, arguing that efforts to restore public trust by addressing this 'deficit' through public education did not recognise that publics often have very nuanced and reflective understandings of science. He reiterated his earlier call (Wynne 1993) for institutions to be more reflexive and responsive as a more effective method of restoring trust and has also called for more robust dialogue with civil society, and an approach that recognises the value of public dialogue and participation in science (Wynne 2014).

This concept of '*participation*' – which in this context could broadly be defined as the inclusion of civil society and/or citizens in otherwise expert or professional processes – has a long and broad history. Whether in design, research, policy, or other fields, it has been utilised as a way to involve those affected by a process and is thus characterised as more democratic and inclusive than non-participatory mechanisms.

'Participation'

The most fundamental tenet of PD is, naturally, participation, and the particular form of participation seen in PD is rooted in the 'rights' movements of the 1960s and '70s

(Simonsen and Robertson 2012). It was originally focussed on technology in the workplace and the way in which workplaces could be democratised (Greenbaum 1993), but soon grew across many other fields and continues to be used in domains as diverse as robotics (Lee et al. 2017), healthcare (Davis et al. 2018), and work with refugee populations (Gordon et al. 2019). Robertson and Simonsen define 'participation' in the context of PD as:

> *to investigate, reflect upon, understand, establish, develop, and support mutual learning processes as they unfold between participants in collective "reflection-in-action" during the design process* (Robertson and Simonsen 2012, 5)

Its roots are both *democratic* – in the sense of inclusivity – and *pragmatic*, in that it represents an attempt to improve outcomes through increased mutual understanding and collaboration. Its development in the 1970s was reflected in the 'participatory turn' (Schubotz 2019) that much of social science took in that decade, also often in response to 'rights' issues. Researchers such as Hall (1975) and Susman and Evered (1978) drew attention to the failings of positivist research approaches and called for a greater involvement of non-specialists in research. In more recent years, this type of participation has also been termed 'co-production' or 'co-creation' and is found in numerous policy and academic fields (for example Department of Health 2007).

Democratising development

PD contains a radical element that positions itself in relation to a scientific 'establishment' and seeks to access and alter that establishment on behalf of all, just as Wynne (1993) suggested. Its operative mode takes challenge and transformation, rather than the continuation of the status quo, as the desirable outcome. Participatory research also shares this democratic imperative and the drive for transformation or change, rather than simply knowledge-gathering or observing (Stoecker 1999). PD as a mechanism for the democratisation of the workplace even made its way into the management literature of the time, where it influenced organisational learning approaches (Brown and Duguid 1991). Significant PD-adjacent work also developed, such as CSCW and HCI. The ethos of PD is well summed-up by the organisation that was formed to expand its reach in ICT – Computer Professionals for Social Responsibility, whose motto was '*Technology is driving the future … It is up to us to do the steering*'.

Who is it that participates?

PD in its original form did not have a concept of 'stakeholders' as such – its focus was historically on working with those who 'use' a technology. (This led some researchers to elide it with user-centred design, an approach criticised by Bannon, Bardzell, and Bødker (2018a) as 'banal' PD, because the user-centred-design does not necessarily involve 'participation' by users in development processes.) PD's original understanding of participation thus involved a more tightly limited group than RRI's inclusion of 'stakeholders' – a term usually understood to mean 'those affected' by a technology. The central conceptualisations of those who are 'participating' are, therefore, substantially different (Robertson and Wagner 2013).

However, perhaps inevitably, PD has had to broaden its understanding of what might be meant by 'democratising innovation' in a wider sense (Björgvinsson, Ehn, and Hillgren 2010) and to change its conceptualisation of who should 'participate'. This is exemplified by the use of PD in ICT fields where it has grappled with the shift away from workplace-centred solutions to international platforms. The altered nature of the subject of the development (the fact that it has moved from an in-office, relatively tailored mode to potentially a single platform being used by many hundreds or thousands of clients) has meant that the definition of 'user' has had to undergo a transformation. This widened definition means that 'participation' in PD may be developing to mean "the involvement of any stakeholders at any point in the process" (Bannon, Bardzell, and Bødker 2018a, 28). This perhaps draws it closer to RRI's inclusion of much wider groups of interested parties (Stahl 2013) and by extension, a broader set of externalities. Bardzell (2018) points out that it can be very difficult to reconcile these broadened aims of PD with a commitment to design experiments 'in the small', which has always been a key tenet of PD processes.

This challenge of deciding *who participates* is not limited to PD. At the same time, as PD was broadening its understanding of who should/could participate, some in the user-centred-design community were reviewing PD and considering whether a narrowing of UCD's focus towards a more PD approach would be beneficial (Sanders and Frascara 2002) – demonstrating that many 'participatory' approaches may tend to experience the same challenges. In particular, the methodological challenges are often shared, and the literature is rich with case studies that describe exactly how these challenges were met. For example, Pilemalm (2018) describes keeping a PD 'diary' during a project, exclusively for documenting the PD practices of the research. This particular project also utilised the idea of 'incrementally' identifying stakeholders throughout a project, recognising that as the development changed, the pool of those affected would potentially shift. This development of PD's understanding of 'users' may be very helpful for RRI to investigate further, although Pilemalm's method here does not appear to have been taken further in PD.

The politics of participation

The political aspects of deciding 'who participates' have always been understood within PD, because the concept of 'politics', in the sense of power relationships, is integral to PD's radical basis and its development from 'rights' movements as discussed above. These power relationships determine questions such as *who is invited to participate? who makes those decisions? what agency do the participants have?* and many other questions, as well as the most fundamental one of all, *will participation be part of the process?* PD has an inbuilt understanding that 'politics' can take many or all of these forms when it comes to participation. van Oudheusden (2014a) unpacks some of these concepts, pointing out that there are politics *of* a system and politics *in* a system – the first relates to structure and the second to process.

Politics of the system

Participation, as it is understood by PD, is overtly political in the first of van Oudheusden's senses, in that one of its defining purposes has always been to challenge and

question systems of dominance (Beck 2002). It shares this ethos of challenge with other forms of participatory work such as action research, which also has a similar view on the importance of empowering its participants (Schubotz 2019). This form of 'political' is used to mean adopting a deliberately democratic stance, by implication in opposition to a dominant power-structure. However, as Beck (2002) makes clear, although participation is necessary, it is not a 'sufficient condition' for altering power structures. It is false logic to assume that because PD has a political focus, carrying out a PD project will resolve political questions. The participatory process can even be completely subverted – Beck (2002) gives the example of a European Commission call in 1995 that employed the phrase 'user participation' to mean large companies such as Unilever, commenting that '*participatory systems design has come to include practices that have no interest in participation as a vehicle for empowerment*' (Beck 2002, 86). However, she holds that PD's political bent is still a significant strength and critiques PD-adjacent disciplines such as CSCW for not having a sufficiently political emphasis (Beck 2002, 87).

Politics in *the system*

Participation is also political in the second, process sense of 'who is enabled to participate'? Decisions about which parties are invited to the table – and the power-dynamic that is implied by the ability to withhold or extend an invitation – are also political decisions (van Oudheusden 2014b). For example, Wagner et al. (2009) discovered – while trying to include local communities in a participatory urban planning exercise – that the relevant municipal authority was reluctant to include those whose views might be critical. Smallman (2019) finds that the views of those involved in public-participation policy exercises are often disregarded for being too 'messy' or difficult to align. Wickson and Carew (2014) discuss how their use of transdisciplinary methods explicitly recognised the politics inherent in their participatory work and designed their workshops to deconstruct existing power relationships to truly democratise the process. These challenges would appear to be common – whether recognised or not – to all participatory systems, whether PD, action research, RRI or participatory TA (van Oudheusden 2011).

Further layers of 'politics' are also inherent elsewhere in these processes, for example, when considering power dynamics in the environment where 'participation' is taking place. Interpersonal relationships are key to these participatory methodologies, and power-differentials between parties must be balanced as far as possible otherwise a sense of disempowerment may cause participants – particularly if they are already marginalised – to disengage. Harrington, Erete, and Piper (2019) take issue with the understanding of 'democracy' in PD, arguing that it is in reality a highly privileged activity – they seek to re-centre PD on what they see as under-served populations and to make marginality more visible. Gautam and Tatar (2020) add that PD assumes participants have agency, but that unless they actually *do* have agency, and equally *know* that they have agency, they may be disengaged or cynical about the meaningfulness of their participation. In addition, there are political dimensions attached to the normative imperatives of any system that seeks to improve a process or an outcome: it is critical to understand that questions about how to make systems or outputs 'better' will inevitably involve different opinions about what 'better' is sought and how to achieve such an end. Uyarra, Ribeiro, and Dale-Clough (2019) examine this in relation to public procurement,

where those responsible for public sector purchasing may seek to achieve change via their purchasing power.

Politics in RRI

It is clear from the above discussion that questions about the politics *in* and *of* the system are essential to understand before attempting to build a truly 'democratised' process of inclusion. These and other political challenges do not go unnoticed in the RRI literature – van Oudheusden (2014b) questions why the broader politics of RRI are not more widely discussed; there is recognition from de Hoop, Pols, and Romijn (2016) that power-relations in participation are under-addressed in RRI; Bauer, Bogner, and Fuchs (2021) call for more attention to be paid to representation in participatory exercises and two-way interactions.

In particular, Eizagirre, Rodríguez, and Ibarra (2017) point out that there is an inherent and unaddressed tension between an inclusive, participatory methodology such as RRI and its adoption by powerful funding and governance bodies. These tensions have not been resolved – Genus and Iskandarova (2018) are sceptical that an institutionalised approach can fundamentally be compatible with an inclusive and reflexive form of anticipatory governance. This is also reflected in work from Jakobsen, Fløysand, and Overton (2019) who discuss how RRI has been propagated as a top-down framework, when a *truly* democratic, grassroots approach would necessarily be instigated from the bottom up.

However, in general, political questions such as these – so fundamental to the understandings in PD – are little-discussed in RRI literature. Unless more directly addressed, unanswered political questions such as '*who participates?*' or '*who is a stakeholder?*' may hamper RRI's efforts to be 'inclusive'. The political aspects of these questions will also inevitably influence the *processes* of operationalised RRI.

Processes and outcomes

The fundamental rationale for both PD and RRI is to improve outcomes. Both share a foundational principle that the quality and value of the outcomes are directly related to the quality and value of the processes of development (Robertson and Wagner 2013). Compare, for example, von Schomberg:

> 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 (von Schomberg 2012)

with Robertson & Simonsen:

> a **process** of investigating, understanding, reflecting upon, establishing, developing, and supporting mutual learning between multiple participants in collective 'reflection-in-action' (Simonsen and Robertson 2012)

These definitions represent a rejection of 'consequentialist' models that judge a system solely on its outputs (in broad terms, that the ends justify the means). Rather, the

rationale of both PD and RRI is geared toward the view that a better process is not only likelier to result in a better outcome, but also that the quality of the process *itself* is important. It should be noted here that a better 'outcome' does not necessarily mean a better 'product' – the better outcome may be *no* product. As de Hoop, Pols, and Romijn (2016) point out, responsible innovation should be about innovating responsibly or possibly not innovating at all. This is a point on which PD and RRI are well-aligned.

The processes of RRI, however, as a relatively young form of participatory practice are still the subject of academic discussion. The deeply-worked and reflective set of criteria for assessing RRI quality from Wickson and Carew (2014) provide support for both the conceptualisation of RRI as a *process* and also the need for a more clearly defined means of evaluating success. Their proposed evaluative method for examining the quality of an RRI process seeks to provide a more structured framework than has hitherto been the case and the insights they draw from their experience in transdisciplinarity offer a valuable perspective in concretising some of these more nebulous aspects of RRI. Similar efforts are seen in the RRI 'maturity model' proposed by Stahl et al. (2017), which again offers a means of evaluating the process. Indeed, some commentators on the progress of RRI regard evaluation as a key element that is currently lacking (Owen et al. 2021).

Another perspective on the RRI process is provided by Boenink and Kudina (2020) who discuss the way in which 'values' are to be decided on as part of these necessary processes, arguing that the values in RRI are the '*evolving results of valuing processes*' rather than fixed 'entities' in themselves that can be regarded as being universally accepted.

Finally, it should also be noted that PD's more tightly defined set of 'users' is also reflected in its ambitions for its processes. RRI, per the von Schomberg definition, seeks broad-brush societal benefit and alignment. PD has traditionally been primarily concerned, as discussed by Bardzell (2018) with small groups of users and the impacts on them. Wider externalities are deliberately avoided. This perhaps makes it a more pragmatic, on-the-ground form of practice than RRI, focused on direct work with a small and known group.

Anticipation

PD and RRI also show common features in the specific processes they incorporate. The central concept of participation has been discussed above, but they also share the aspect of relating present work to future possibilities. PD is very explicit that it is about '*envisioning future use*' (Robertson and Wagner 2013), and in fact, designs may only be finalised 'in use'. RRI, meanwhile, includes 'anticipation' as a specific part of the Anticipate-Reflect-Engage-Act Framework – the form of RRI most widely adopted in the UK (Stilgoe, Owen, and Macnaghten 2013).

Both PD (Robertson and Wagner 2013) and RRI (Lehoux, Miller, and Williams-Jones 2020) share an understanding that 'moral imagination' – the process of imagining possible impacts and outcomes – is an important element of relating the development process to the future in which it will be deployed. The act of anticipating potential outcomes, both positive and negative, acknowledges and makes visible the part-accountability of the innovator for events that have yet to transpire.

Reflexivity

Necessarily linked to anticipation is another common factor – reflection. Reflection as it is understood in PD is explicitly grounded in the work of Schön (1983) on 'reflection-in-action'. This work was part of Schön's conceptualisation of *professionalism* and what it means to be a professional (itself the subject of considerable debate, eg Lester 2002). The link between reflexivity and professionalism understood by Schön is also discussed by scholars in reflective practice such as Moon (2004) and Sen (2010) who, like Schön (1983), regard the processes of reflection as a vital component in this state of 'being a professional'. In terms of PD, Ehn (2002) discusses this form of professionalism as a "synthesis of constructive action and critical reflection" (Ehn 2002, 21) – turning 'reflection-in-action' into critique and response. As Yanow and Tsoukas (2009) explain, this is active, iterative reflection, experienced in the moment and allowing for adaptive change 'on the fly' – a 'professional' is someone who is able to respond and adjust their approaches *as they carry out the work* in a way that through practice has become almost instinctive.

Within the RRI discourse, by contrast, there are ongoing assertions of the importance of the reflective element (eg Steen 2021), but methodologies and interpretations vary widely. Work on 'collaborative' reflexivity from Grimpe et al. (2020) examines how intra-organisational processes and decisions can contribute to institutional reflexivity and learning, providing a valuable understanding of these processes in funders, but is not directed towards the responsibility of the individual for their own reflective processes. A more individualised approach comes from Hesjedal et al. (2020), who analyse an attempt to teach participants on a course to reflect upon their own practices and values. Others have created tools to assist with the work of reflection: for example, Felt, Fochler, and Sigl (2018) examined different methods for encouraging technologists to reflect on their work and created a set of ideation cards that could assist researchers in RRI reflection (while noting that reflexive work was often 'delegated' to social science researchers). Another approach comes from van der Meij, Broerse, and Kupper (2017), who investigate how the concept of 'playfulness' might potentially be valuable in terms of reflection in RRI – they propose an '*intellectually curious, alert, flexible, inventive and prejudice-free*' process (van der Meij, Broerse, and Kupper 2017, 56). This conceptualisation involves a spirit of experimentation and imagination and it is easy to see how this could usefully inform elements of anticipatory work and engagement.

However, as fruitful and rich as these types of reflection might be, it is not clear how they connect to a forward-moving, purposive RRI process that has the iterative, learning character described elsewhere (e.g. Owen et al. 2013) and that could draw on the 'reflection-in-action' mode that is familiar to PD. PD's awareness of the connection between internal reflection and adaptation/response that is part of improving performance is thus to some degree externalised in RRI – it moves from an internal condition of iterative learning to an outward response that may have no effect on the practitioner. It is here that PD may bring useful insights for reflection in RRI – whether or not RRI practitioners would term themselves 'professionals', the adoption and practice of RRI could gain valuable depth from PD's insights on reflection-in-action and the iterative, adaptive mindset that this perspective offers. Additionally, professional practice in many disciplines (for example librarianship, teaching) requires not only reflective practice but *documented* reflexivity in order that the learning process is articulated and understood

more clearly (eg Feucht, Lunn Brownlee, and Schraw 2017). This does not appear to be a current practice in either PD or RRI, but maintaining a log of reflective considerations (as with the PD 'diary' described above by Pilemalm 2018) could provide a useful track record of the relevant deliberations.

Challenges for participatory methods

As mentioned earlier, in broadening its scope, PD has encountered many of the difficulties experienced by other methodologies that include participation, including RRI. This includes many of the same issues when it comes to stakeholders – theoretical questions around who is included, and how much agency or power they have. These challenges are not limited to PD and RRI, but are common to participatory approaches in general, including action research. Considerations such as 'how to manage participants' expectations?', 'what if you *cannot* transform a situation?' are discussed across the social sciences.

Many of the methodological questions that PD has come to face are also similar to those faced by RRI. Expanding the pool of stakeholders expands the potential externalities for anticipatory purposes, so where is the logical place to stop including stakeholders? And at what point exactly should 'participation' begin and where should it end? Beck (2002) points out in the PD discourse that 'intervention requires a location' – ie how do you know where or when to engage? This is also a challenge for RRI for the same reasons – that of identifying where in the innovation process to start involving stakeholders. Beck (2002) also noted – as does Smallman (2018) on RRI – that participatory approaches are no guarantee of fairness, change, or accountability, and that the results of user or stakeholder consultation and engagement can often be set aside for political reasons.

Methodological questions are also common to both PD and RRI – such as the fundamental challenge of how exactly 'participation' is achieved. Not only are there the political challenges detailed above, but participation can be very difficult to enact in practice (Hartley et al. 2019). Pilemalm claims that PD is "not a single approach" and does not specify any further (Pilemalm 2018, 5:7), but does point out that many of the methodological challenges PD struggles with have been present for decades, including its tendency to define 'users' very narrowly. By contrast, Long et al. (2020) identify a different set of challenges for RRI's wider, societal-alignment remit, including the point that addressing societal challenges may mean operating at the boundaries of socio-ethical issues.

These are challenges to which neither PD nor RRI currently has concrete answers – Long et al. (2020) created a tool to try and help practitioners identify socio-ethical challenges in their work and the development of assistive/facilitative instruments (e.g. 'RRI Tools,' n.d.) is not an unusual response to the challenge. However, it may be that there are no 'correct' answers in any case – Bødker and Kyng (2018) point out that PD is as much about possibilities and alternatives as it is about specific solutions and this may be equally true for RRI, especially given the importance for both PD and RRI of '*process*' as discussed above.

Lessons and recommendations for RRI

It has been shown that PD and RRI have challenges in common, particularly around questions of 'participation', but there are important differences in the

way PD and RRI approach these challenges. This paper has compared the relative literatures of PD and RRI in these areas and concludes that there are both practical and theoretical lessons for RRI from PD's long history of pragmatism and more radical roots.

Recommendation 1: project-management for RRI

A **project-management-type structure for RRI**, set up in advance with stage-gates, key decisions, and relevant factors documented, could have appeal for practices and methodologies where the use of imagination, reflection and engagement is less well-known than in the social sciences, providing a scaffold for RRI activities. Such a structured approach would be related to the account by Pilemalm (2018) of a PD project 'diary'. This documentation modality could prove useful to the ongoing RRI discourse of how best to operationalise it in ways that can assist practitioners in identifying concrete tasks to be undertaken in any given project. It could incorporate the numerous discussions, decisions and possibilities that innovation work throws up during the process. Such an RRI 'journal' could provide not just an ongoing record throughout the life of a project, but potentially be a useful source of information for others working in similar fields.

Recommendation 2: participation and stakeholders

Developing practical participant-identification methods for RRI, such as an *iterative stakeholder recruitment framework* tailored to different phases of development, similar to the approach described by Pilemalm (2018), could very usefully be adopted by RRI as it continues to formulate working methodologies for use in different fields and along various points in the innovation timeline. The paper has discussed that the question of '*who participates*' is not definitively established by either PD or RRI, but also pointed out that this is a challenge for all participatory methodologies. As a longer-established field, PD has a significant practical experience, numerous case studies across many areas, and a long history of understanding best-practice engagement at the micro-project level and can thus provide a valuable resource for RRI to draw on.

Recommendation 3: the politics of innovation

The question '*who participates?*', as argued above, is significant in terms of questions of power, and it is here that PD's understanding of the political contexts of innovation is seen most clearly. The explicit concern with dominance patterns could be centralised by RRI to better engage with the democratic principles that are necessarily a part of participatory methodologies. Such democratic involvement speaks to a principle of equality. If participatory methodologies of innovation have an inherently political position that reserves the right to challenge the status quo, then RRI is necessarily as political at its core as PD – but this is little discussed. RRI may need to foreground this political challenge in a more conscious way and create a means to address these political challenges more directly.

Conclusions

As seen at the outset of this paper, relationships between RRI and its various predecessors are often discussed in the literature. Practices such as TA – and its various offshoots such as real-time TA and so on – are acknowledged as significant contributors. However, approaches such as TA are focused on the outputs and impacts of research and innovation. This paper has attempted, by investigating the relationship with PD, to highlight the importance of the *processes* of research and innovation. PD offers insights into the challenges and benefits of participatory methods, and in particular, the opportunity they present for unpacking power differentials and the lens they provide to examine the politics in the system.

Finally, this political lens can also be applied to the adoption of RRI as a high-level policy both in the EU and within UK funder stipulations. This adoption and (to a degree) institutionalisation may suggest that it has gained broad approval. However, another possible interpretation is that this acceptance at high levels of policy is a form of institutional capture; comparing RRI with PD highlights that there may be an unacknowledged tension here between RRI's position as a 'democratic' and participatory framework, and its adoption by institutional bodies. If RRI is to truly be a democratic process it may need to more explicitly recognise that the approaches it endorses are *challenges* to established modalities, and therefore, perhaps should not sit easily within existing funding and research frameworks that have their own 'incumbent logics'. Further work to investigate and more explicitly foreground the political aspects of RRI could establish a more radical framing, and connect this participatory, democratic methodology to PD – one of its most notable contributors.

Note

1. connectedpapers.com.

Notes on contributors

Carolyn Ten Holter is a researcher in the Responsible Technology Institute at the University of Oxford. She has over twenty years of experience in the private sector and is currently investigating responsible innovation in novel technologies including autonomous vehicles and quantum computing.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Carolyn Ten Holter http://orcid.org/0000-0001-8739-3211

References

Abdulla, A., P. Vaishnav, B. Sergi, and D. G. Victor. 2019. "Limits to Deployment of Nuclear Power for Decarbonization: Insights from Public Opinion." *Energy Policy* 129 (March): 1339–1346.

Bannon, L., J. Bardzell, and S. Bødker. 2018a. Reimagining Participatory Design—Emerging Voices. *ACM Trans. Comput.-Hum. Interact*. 25 (1).
Bannon, L., J. Bardzell, and S. Bødker. 2018b. Special Issue on Reimagining participatory design.
Bardzell, S. 2018. "Utopias of Participation: Feminism, Design, and the Futures." *ACM Transactions on Computer-Human Interaction* 25 (1): 1–24.
Bauer, A., A. Bogner, and D. Fuchs. 2021. "Rethinking Societal Engagement Under the Heading of Responsible Research and Innovation: (novel) Requirements and Challenges." *Journal of Responsible Innovation* 8 (3): 342–363.
Beck, E. 2002. "P for Political: Participation is Not Enough." *Scandinavian Journal of Information Systems* 14 (1): 77–92. https://aisel.aisnet.org/sjis/vol14/iss1/1.
Björgvinsson, E., P. Ehn, and P. A. Hillgren. 2010. "Participatory Design and 'Democratizing Innovation'." In Proceedings of the 11th Biennial Participatory Design Conference (pp. 41-50). Sydney, Australia.
Boenink, M., and O. Kudina. 2020. "Values in Responsible Research and Innovation: From Entities to Practices." *Journal of Responsible Innovation* 7 (3): 450–470.
Bødker, S., and M. Kyng. 2018. "Participatory Design That Matters-Facing the Big Issues." *ACM Transactions on Computer-Human Interaction* 25 (1): 1–31.
Brouneus, F., M. Lindholm, and G. Bohlin. 2019. "Telling it Straight - A Focus Group Study on Narratives Affecting Public Confidence in Science." *Journal of Science Communication* 4 (1): 75–84.
Brown, J. S., and P. Duguid. 1991. "Organizational Learning and Communities-of-Practice: Toward a Unified View of Working, Learning, and Innovation." *Organization Science* 2 (1): 40–57.
Burke, D. 2004. "GM Food and Crops: What Went Wrong in the UK?" *EMBO Reports* 5 (5), 432–436. http://www.ncbi.nlm.nih.gov/pubmed/15184970%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC1299063.
Dalquist, S. 2004. "A Chronology of Public Opinion on Nuclear Power in the United States and United Kingdom." *Timeline*.
Davis, S. R., D. Peters, R. A. Calvo, S. M. Sawyer, J. M. Foster, and L. Smith. 2018. "Kiss MyAsthma": Using a Participatory Design Approach to Develop a Self-Management app with Young People with Asthma." *Journal of Asthma* 55 (9): 1018–1027.
de Hoop, E., A. Pols, and H. Romijn. 2016. "Limits to Responsible Innovation." *Journal of Responsible Innovation* 3 (2): 110–134.
de Saille, S. 2015. "Innovating Innovation Policy: The Emergence of 'Responsible Research and Innovation'." *Journal of Responsible Innovation* 2 (2): 152–168.
Department of Health. 2007. "Putting People First: A Shared Vision and Commitment to the Transformation of Adult Social Care." London. doi:10.1097/NHH.0000000000000762.
Ehn, P. 2002. "Neither Bauhäusler nor Nerd: Educating the Interaction Designer." Proceedings of the Conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques, DIS, 19–23. doi:10.1145/778712.778717
Eizagirre, A., H. Rodríguez, and A. Ibarra. 2017. "Politicizing Responsible Innovation: Responsibility as Inclusive Governance." *International Journal of Innovation Studies* 1 (1): 20–36..
European Commission. 2020. "Science with and for Society (SWAFS)." https://ec.europa.eu/research/swafs/index.cfm.
Felt, U., M. Fochler, and L. Sigl. 2018. "IMAGINE RRI. A Card-Based Method for Reflecting on Responsibility in Life Science Research." *Journal of Responsible Innovation* 5 (2): 201–224.
Feucht, F. C., J. Lunn Brownlee, and G. Schraw. 2017. "Moving Beyond Reflection: Reflexivity and Epistemic Cognition in Teaching and Teacher Education." *Educational Psychologist*, 52 (4): 234–241.
Fisher, E., M. O'rourke, R. Evans, E. B. Kennedy, M. E. Gorman, and T. P. Seager. 2015. "Mapping the Integrative Field: Taking Stock of Socio-Technical Collaborations." *Journal of Responsible Innovation* 2 (1): 39–61.
Gautam, A., and D. Tatar. 2020. "P for Political: Participation Without Agency is Not Enough." *ACM International Conference Proceeding Series* 2: 45–49..

Genus, A., and M. Iskandarova. 2018. "Responsible Innovation: Its Institutionalisation and a Critique." *Technological Forecasting and Social Change* 128: 1–9.
Genus, A., and A. Stirling. 2018. "Collingridge and the Dilemma of Control: Towards Responsible and Accountable Innovation." *Research Policy* 47 (1): 61–69.
Gordon, R., M. Vasalou, O. Abu-Amsha, L. Benton, and B. Webster. 2019. "Access to Higher Education: Reflections on a Participatory Design Process with Refugees." *Journal on Education in Emergencies* 5 (1). https://research.birmingham.ac.uk/portal/en/publications/access-to-higher-education-reflections-on-a-participatory-design-process-with-refugees(6750a2d0-3c4e-493c-9d87-a3257149b00c).html.
Greenbaum, J. 1993. "PD: A Personal Statement." *Communications of the ACM* 36 (4): 1993–1993.
Grimpe, B., B. C. Stahl, C. Ten Holter, P. Inglesant, G. Eden, M. Patel, and M. Jirotka. 2020. "From Collaborative to Institutional Reflexivity: Calibrating Responsibility in the Funding Process." *Science and Public Policy* 47 (5): 720–732.
Grunwald, A. 2011. "Responsible Innovation: Bringing Together Technology Assessment, Applied Ethics, and STS Research." *Enterprise and Work Innovation Studies* 31: 10–19. https://run.unl.pt/handle/10362/7944.
Hall, B. 1975. "Participatory Research: An Approach for Change." *Convergence* 8 (2). https://search.proquest.com/openview/924581c113af58c8db8a46314b53bb7b/1?pq-origsite=gscholar&cbl=2030445.
Harrington, C. N., S. Erete, and A. M. Piper. 2019. "Deconstructing Community-Based Collaborative Design: Towards More Equitable Participatory Design Engagements." *Proceedings of the ACM on Human-Computer Interaction* 3: 1–25.
Hartley, S., C. McLeod, M. Clifford, S. Jewitt, and C. Ray. 2019. "A Retrospective Analysis of Responsible Innovation for Low-Technology Innovation in the Global South." *Journal of Responsible Innovation* 6 (2): 143–162.
Hern, A. 2020. "5G Conspiracy Theories Fuel Attacks on Telecoms Workers." *The Guardian*. https://www.theguardian.com/business/2020/may/07/5g-conspiracy-theories-attacks-telecoms-covid.
Hesjedal, M. B., H. Åm, K. H. Sørensen, and R. Strand. 2020. "Transforming Scientists' Understanding of Science–Society Relations. Stimulating Double-Loop Learning When Teaching RRI." *Science and Engineering Ethics* 26 (3): 1633–1653.
House of Lords Science & Technology Select Committee. 2000. *Science and Society*. https://publications.parliament.uk/pa/ld199900/ldselect/ldsctech/38/3801.htm.
Jakobsen, S. E., A. Fløysand, and J. Overton. 2019. "Expanding the Field of Responsible Research and Innovation (RRI)–from Responsible Research to Responsible Innovation." *European Planning Studies* 27 (12): 2329–2343.
Lee, H. R., S. Sabanovi, W. L. Chang, S. Nagata, J. Piatt, C. Bennett, and D. Hakken. 2017. "Steps Toward Participatory Design of Social Robots: Mutual Learning with Older Adults with Depression." ACM/IEEE International Conference on human-robot Interaction, Vol. Part F127194, 244–253, IEEE Computer Society. doi:10.1145/2909824.3020237
Lehoux, P., F. A. Miller, and B. Williams-Jones. 2020. "Anticipatory Governance and Moral Imagination: Methodological Insights from a Scenario-Based Public Deliberation Study." *Technological Forecasting and Social Change* 151, 1–13. https://doi.org/10.1016/j.techfore.2019.119800.
Lester, S. 2002. "Becoming a Profession: Conservation in the UK." *Journal of the Society of Archivists* 23 (1): 87–94.
Long, T. B., V. Blok, S. Dorrestijn, and P. Macnaghten. 2020. "The Design and Testing of a Tool for Developing Responsible Innovation in Start-up Enterprises." *Journal of Responsible Innovation* 7 (1): 45–75.
Moon, J. A. 2004. *Reflection in Learning and Professional Development: Theory and Practice*. New York, NY: Routledge Falmer.
Owen, R., P. Macnaghten, and J. Stilgoe. 2012. "Responsible Research and Innovation: From Science in Society to Science for Society, with Society." *Science and Public Policy* 39 (6): 751–760.
Owen, R., M. Pansera, P. Macnaghten, and S. Randles. 2021. "Organisational Institutionalisation of Responsible Innovation." *Research Policy* 50 (1): 104132.

Owen, R., J. Stilgoe, P. Macnaghten, M. Gorman, E. Fisher, and D. Guston. 2013. "A Framework for Responsible Innovation." In *Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society*, edited by R. Owen, J. Bessant, and M. Heintz, 27–50. Oxford: Wiley. doi:10.1002/9781118551424.ch2.

Pilemalm, S. 2018. "Participatory Design in Emerging Civic Engagement Initiatives in the New Public Sector: Applying PD Concepts in Resource-Scarce Organizations." *ACM Transactions on Computer-Human Interaction* 25 (1): 1–26.

Robertson, T., and J. Simonsen. 2012. "Challenges and Opportunities in Contemporary Participatory Design." *Design Issues* 28 (3): 3–9.

Robertson, T., and I. Wagner. 2013. "Ethics: Engagement, Representation and Politics-in-Action." In *The Routledge International Handbook of Participatory Design*, edited by J. Simonsen, and T. Robertson, 64–85. New York, NY: Routledge.

RRI Tools. n.d. Accepted March 22, 2021. https://rri-tools.eu/.

Sanders, B.-N. E., and J. Frascara. 2002. "From User-Centered to Participatory Design Approaches." In *Design and the Social Sciences*, edited by J. Frascara, 1–8. Taylor & Francis. https://doi.org/10.1201/9780203301302.ch1.

Schön, D. A. 1983. *The Reflective Practitioner: How Professionals Think in Action*. Boston, MA: Basic Books. doi:10.4324/9781315237473.

Schubotz, D. 2019. *Participtory Research: Why and How to Involve People in Research*. London: Sage Publications Ltd.

Sen, B. A. 2010. "Reflective Writing: A Management Skill." *Library Management* 31 (1/2): 79–93.

Simonsen, J., and T. Robertson. 2012. "An Introduction." In *Routledge International Handbook of Participatory Design*, edited by J. Simonsen and T. Robertson, 1–17. Routledge. https://doi.org/10.4324/9780203108543.ch3

Smallman, M. 2018. "Science to the Rescue or Contingent Progress? Comparing 10 Years of Public, Expert and Policy Discourses on New and Emerging Science and Technology in the United Kingdom." *Public Understanding of Science* 27 (6): 655–673.

Smallman, M. 2019. "Nothing to Do with the Science': How an Elite Sociotechnical Imaginary Cements Policy Resistance to Public Perspectives on Science and Technology Through the Machinery of Government." *Social Studies of Science*, 50 (4): 589–608.

Stahl, B. C. 2013. "Responsible Research and Innovation: The Role of Privacy in an Emerging Framework." *Science and Public Policy* 40 (6): 708–716.

Stahl, B. C., K. Chatfield, C. Ten Holter, and A. Brem. 2019. "Ethics in Corporate Research and Development: Can Responsible Research and Innovation Approaches aid Sustainability?" *Journal of Cleaner Production* 239: 118044.

Stahl, B., M. Obach, E. Yaghmaei, V. Ikonen, K. Chatfield, and A. Brem. 2017. "The Responsible Research and Innovation (RRI) Maturity Model: Linking Theory and Practice." *Sustainability* 9 (6): 1036.

Steen, M. 2021. "Slow Innovation: The Need for Reflexivity in Responsible Innovation (RI)." *Journal of Responsible Innovation* 8 (2): 254–260.

Stilgoe, J., R. Owen, and P. Macnaghten. 2013. "Developing a Framework for Responsible Innovation." *Research Policy* 42 (9): 1568–1580.

Stoecker, R. 1999. "Are Academics Irrelevant? Roles for Scholars in Participatory Research." *American Behavioral Scientist* 42 (5): 840–854.

Susman, G. I., and R. D. Evered. 1978. "An Assessment of the Scientific Merits of Action Research." *Administrative Science Quarterly* 23 (4): 582.

UK Research and Innovation. 2018. "UKRI Centres for Doctoral Training in Artificial Intelligence." https://www.ukri.org/research/themes-and-programmes/ukri-cdts-in-artificial-intelligence/.

Uyarra, E., B. Ribeiro, and L. Dale-Clough. 2019. "Exploring the Normative Turn in Regional Innovation Policy: Responsibility and the Quest for Public Value." *European Planning Studies* 27 (12): 2359–2375.

van der Meij, M. G., J. E. W. Broerse, and F. Kupper. 2017. "Conceptualizing Playfulness for Reflection Processes in Responsible Research and Innovation Contexts: A Narrative Literature Review." *Journal of Responsible Innovation* 4 (1): 43–63.

van Oudheusden, M. 2011. "Questioning "Participation": A Critical Appraisal of its Conceptualization in a Flemish Participatory Technology Assessment." *Science and Engineering Ethics* 17 (4): 673–690.
van Oudheusden, M. 2014a. "Learning in, Through, and About Participatory Technology Assessment: The Case of Nanotechnologies for Tomorrow's Society (NanoSoc)." *Technology Analysis and Strategic Management* 26 (7): 825–836.
van Oudheusden, M. 2014b. "Where are the Politics in Responsible Innovation? European Governance, Technology Assessments, and Beyond" *Journal of Responsible Innovation* 1 (1): 67–86.
von Schomberg, R. 2012. "Prospects for Technology Assessment in a Framework of Responsible Research and Innovation." In *Technikfolgen abschätzen lehren*, 39–61. VS Verlag für Sozialwissenschaften. doi:10.1007/978-3-531-93468-6_2.
von Schomberg, R. 2013. "A Vision of Responsible Research and Innovation." In *Responsible Innovation*. edited by R. Owen, J. Bessant, and M. Heintz, 1st ed., 51–74. Hoboken, NJ: John Wiley & Sons, Ltd. http://onlinelibrary.wiley.com/doi/10.1002/9781118551424.ch3/summary.
Wagner, I., M. Basile, L. Ehrenstrasser, V. Maquil, J.-J. Terrin, and M. Wagner. 2009. "Supporting Community Engagement in the City." C&T '09: Proceedings of the Fourth International Conference on Communities and Technologies, 185. doi:10.1145/1556460.1556488
Wickson, F., and A. L. Carew. 2014. "Quality Criteria and Indicators for Responsible Research and Innovation: Learning from Transdisciplinarity." *Journal of Responsible Innovation* 1 (3): 254–273.
Wynne, B. 1993. "Public Uptake of Science: A Case for Institutional Reflexivity." *Public Understanding of Science* 2 (4): 321–337.
Wynne, B. 2006. "Public Engagement as a Means of Restoring Public Trust in Science - Hitting the Notes, but Missing the Music?" *Public Health Genomics* 9: 211–220.
Wynne, B. 2014. "Further Disorientation in the Hall of Mirrors." *Public Understanding of Science* 23 (1): 60–70.
Yanow, D., and H. Tsoukas. 2009. "What is Reflection-in-Action? A Phenomenological Account." *Journal of Management Studies* 46 (8): 1339–1364.