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Grappling with Diversity in Research Through Design

Boudewijn BOON[a*], Ehsan BAHA[b, c], Abhigyan SINGH[a], Frithjof E. WEGENER[c, d], Marco C. ROZENDAAL[a], Pieter Jan STAPPERS[a]

[a] Department of Human-Centered Design, Delft University of Technology, The Netherlands
[b] Department of Design, Organization and Strategy, Delft University of Technology, The Netherlands
[c] Meaningwise, Eindhoven, the Netherlands
[*] Corresponding author e-mail: m.j.b.boon@tudelft.nl
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Abstract: Since its introduction, Research through Design (RtD) has taken on a wide variety of forms. Currently, there is a lack of clarity about what connects and separates different RtD approaches. Several attempts have been made to clarify these matters, often in the form of a top-down categorization. Here we start on a different path, one that is open for different points of view and grounded in the ongoing concerns and needs of RtD practitioners. Over two months, we engaged a local research community in weekly discussions about RtD in their work. Thoughts and questions were posted on a dedicated wall-space, maintained, and clustered over the weeks. As a result, we identified 11 themes that indicate concerns among participants about RtD. We suggest the themes can help in articulating different RtD 'styles' and 'genres', and believe this should be a collaborative and bottom-up effort that crosses disciplinary and institutional boundaries.

Keywords: research through design; practice-based research; constructive design research; design-led research

1. Introduction

Research through Design (RtD) refers to a way of doing research in which design activities play an essential role in the generation of knowledge. Introduced by Frayling (1993), RtD is commonly distinguished from research for design – i.e. research that aims to inform design practice – and research on (or about) design – i.e. research that aims to understand design practice (Forlizzi et al., 2009). Since its introduction, different design schools and disciplines increasingly have adopted RtD. Over the years, research communities have emerged that disseminate their RtD work in conferences, such as Design Research Society (DRS), Human Factors in Computing Systems (CHI), Designing Interactive Systems (DIS), and, very specifically, the Research Through Design conference (RTD). As a result, there are seemingly disparate ways of understanding and practicing RtD.

The RTD2019 conference, which was hosted in Delft, the Netherlands, explicitly sought to bring together these divergent understandings of RtD. The conference, in the words of the organizers, aimed to "explore frictions and affinities among different RtD traditions" and to "open up to new audiences" (Research Through Design Conference website, n.d.). In line with this aim, the selection of papers and artefacts presented during the conference revealed a wide variety of approaches to RtD. Among several participants, a conversation emerged in which a lack of clarity was sensed about what connected and separated these different approaches. The authors of this paper, some of whom were part of this conversation, have come to frame this struggle as one of 'grappling with diversity' in RtD.

Over the last decade or so, several scholars attempted to get a grip on diversity in RtD, resulting in various categorizations and overviews. For example, Chow (2010) aims to clarify different versions of RtD by comparing 'practice-led research', 'project-grounded research', and 'research through design'. Koskinen et al. (2011) describe three RtD approaches – 'lab', 'field' and 'showroom' – each based on different historical foundations. Dow et al. (2013) suggest that RtD approaches differ along three dimensions: how far in the future designs are projected; where and how artefacts are used to generate knowledge; and the design researcher's philosophical stance. Lenzholzer et al. (2013) propose a categorization of RtD approaches in landscape architecture, based on Creswell's distinction of positivism, constructivism, advocacy/participatory, and pragmatism. Godin & Zahedi (2014) aim to 'federate' different views on RtD, comparing them according to ontological aspects, epistemological aspects, expected contributions, methodological aspects, and limits. Krogh et al. (2015) distinguish five methods of experimentation in RtD based on how knowledge is built up. Stappers & Giaccardi (2017) provide a comprehensive account of RtD, reporting on the various ongoing discussions in the literature. Finally, discussions in human-computer interaction have focused on distinguishing 'pragmatic' from 'critical' RtD approaches (Forlizzi et al., 2018; Bardzell, 2019), as well as on the 'how', 'with whom' and 'why' of RtD (Anderson et al., 2019). Common to these categorizations and overviews is a retrospective top-down categorization of published work.

The literature mentioned above contains valuable contributions to the discourse regarding RtD and its future. Many of these authors have made attempts to 'grapple with diversity', trying to clarify and articulate RtD from a particular point of view. Yet, as pointed out by Stappers and Giaccardi (2017), "the involved communities are still struggling to find the right words, models, and practices". Similarly, attendees of the RTD2019 conference voiced struggles in understanding the similarities and differences between different RtD approaches. For this reason, instead of developing and proposing yet another top-down categorization of RtD, we start on a different path – one that is open for different points of view and grounded in the ongoing concerns, needs and practices of RtD practitioners[1]. In what follows, we take an initial step in this direction, where our goal is to understand the thoughts and questions that RtD practitioners are struggling with in relation to RtD. We share a synthesis of these

1 With 'RtD practitioners' we refer to researchers who are, or have been, actively engaged in research projects where design activities play an important role in the generation of knowledge.

thoughts and questions and discuss how this illuminates a way forward to differentiate between various RtD approaches in a bottom-up, collaborative, and cross-disciplinary way.

2. Approach

To understand the thoughts and questions that RtD practitioners are struggling with, we hosted a series of 'RtD LabTalks'. These sessions offered an open platform to a local design research community for sharing, discussing, and reflecting on their RtD work (see Figure 1). The community was based in a university of technology, and the majority of participants have engaged in RtD projects. The RtD LabTalks consisted of eight weekly sessions spread over two months – seven sessions that aimed at collecting and mapping thoughts and questions, and a final session that was dedicated to an overall reflection on the outcomes of the earlier seven sessions (Figure 2).

Figure 1 *Impression of an RtD LabTalk with participants writing post-it notes and placing them on the dedicated wall-space.*

The RtD LabTalks 1-7 included three types of participants: moderators, speakers, and audience-as-discussants. All the participants were design researchers with diverse backgrounds (e.g. anthropology, architecture, computer science, industrial design, management, psychology, and sociology). Three authors of this paper were the moderators of the RtD LabTalks[2]. Three other authors took part as speakers[3]. In total, 19 speakers presented work related to RtD. The speakers included three full professors, two associate professors, eight assistant professors, one post-doc, and six PhD candidates. Half of the speakers were Dutch, while the other half contained a mix of nationalities (i.e. Australian, Canadian, Danish, French, German, Iranian, Italian, and Polish). Overall, the speakers could be divided into two slightly overlapping categories. Some were design researchers that applied RtD in their projects (e.g. Baha et al., 2018; D'Olivo et al. 2017; Bendor et al. 2017). Other design researchers have contributed to the theoretical development of RtD (e.g., Boess, 2009; Stappers & Giaccardi, 2017; Sleeswijk Visser, 2018; Vermeeren et al. 2016). Some speakers presented general topics, such as a pragmatist perspective on RtD and

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similarities of RtD to other fields of research. In contrast, others presented particular RtD cases, on topics such as 'museum experience' and 'city-making'. Each of the RtD LabTalks engaged an audience of 20-30 discussants.

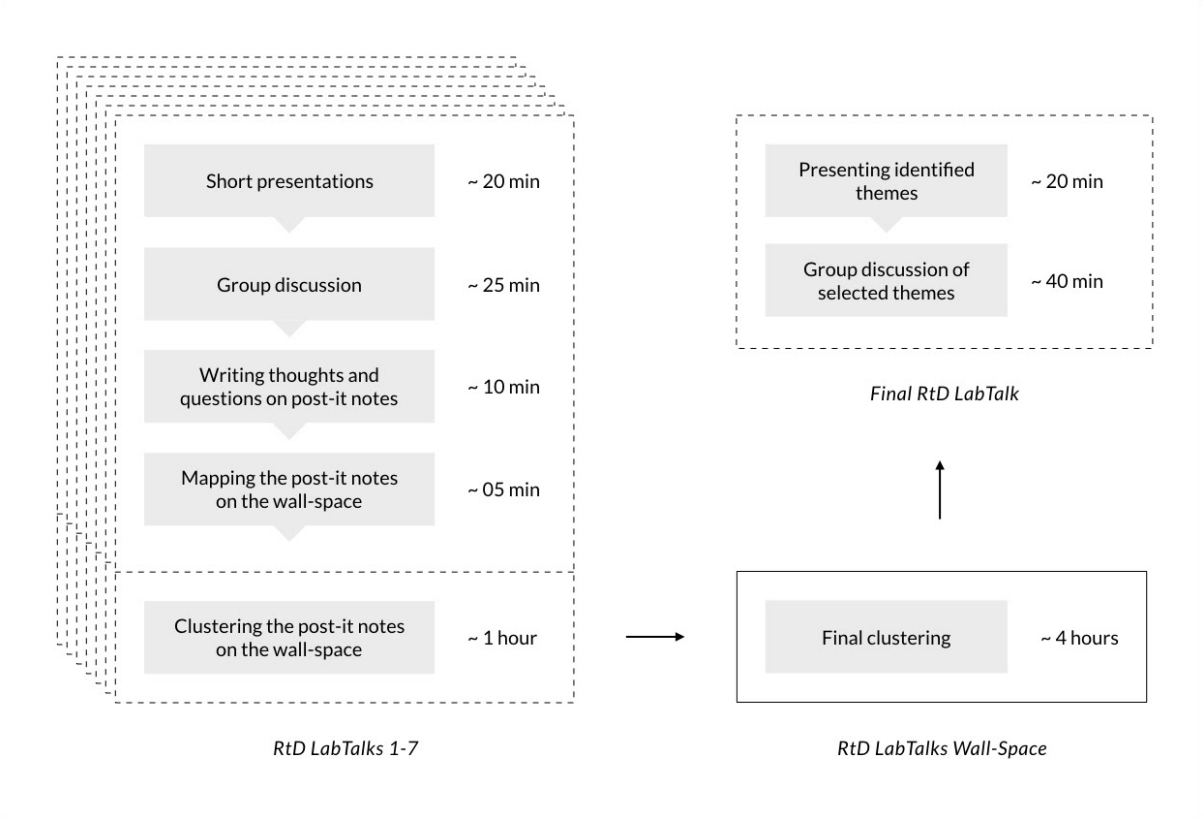

Figure 2 Schematic overview of the RtD LabTalk sessions

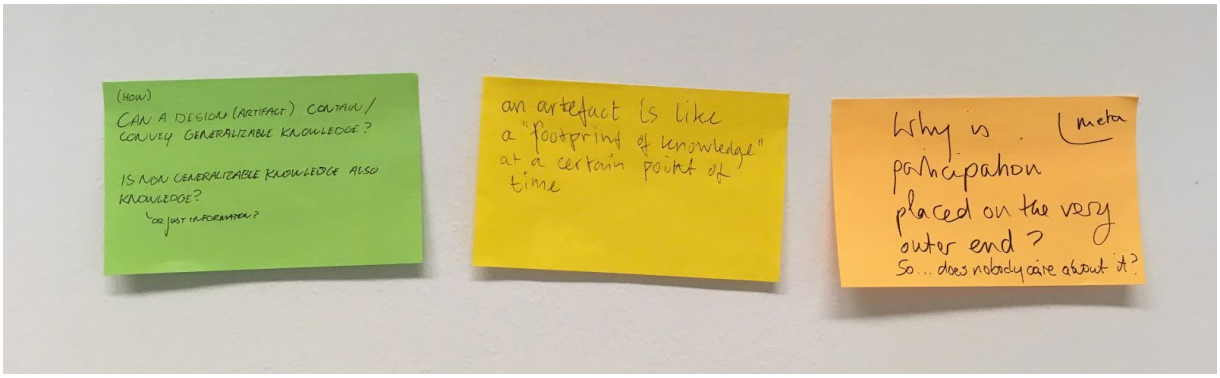

Figure 3 Different types of participant contributions: questions (left), statements (center), and meta-reflections (right).

The final RtD LabTalk involved a meta-reflection on the outcomes of the RtD LabTalks 1-7. To prepare for the final LabTalk, the moderators did a final clustering by thoroughly going through all the clusters and content generated in the LabTalks 1-7. Some post-it notes were excluded from the clustering as their content was either unclear or contained reflections on

the format of the RtD LabTalks itself (see 'Excluded content' in Figure 4)[4]. The final LabTalk started with the moderators presenting an overview of all the 11 themes to the audience (20 minutes). Following the presentation of the overview, four themes (Knowledge, Process, Quality, and Philosophy) were proposed by moderators for discussion. Each of the themes was discussed for 10 minutes. The idea behind discussing these themes was for everyone to better grasp and understand the nature of the themes and to explore their value. The final LabTalk ended with a discussion regarding the overall lessons learned from the RtD LabTalks.

3. Findings

3.1 RtD LabTalks 1-7: identified themes

Clustering of the contributed post-it notes on the wall-space resulted in 11 RtD-related themes (see Figure 4). The location of the themes on the wall-space is arbitrary – i.e., the relative positioning of the clusters does not imply thematic closeness. The size of the marked areas indicates the amount of discussion on a particular theme. What stands out is that most contributions concern the 'Philosophy' of RtD. Other major themes are 'Knowledge', 'Designer/researcher', 'Process', 'Quality', and 'Artefacts'. Remaining themes were 'Research Questions', 'Participation', 'Relevance', 'Making', and 'Project Context'. The 11 themes indicate important thoughts and questions of RtD practitioners, which are described in more detail below.

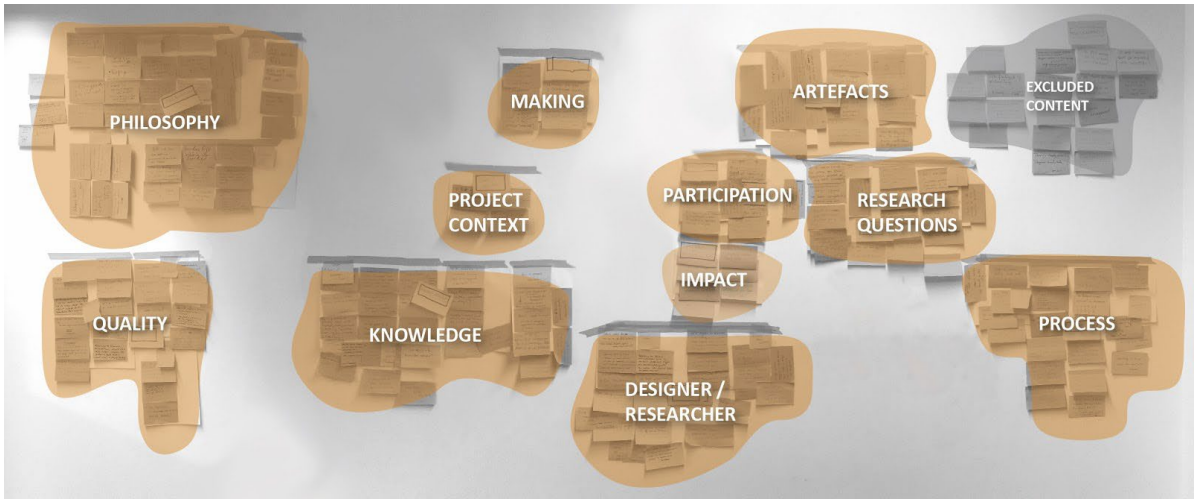

Figure 4 *The RtD LabTalks resulted in 11 themes based on participants' thoughts and questions about RtD.*

4 During the writing of this paper, we made a final adjustment to the clusters and their respective titles.

1. **Philosophy** – discussion regarding beliefs and definitions of RtD.
   Associated questions: What is RtD? Is it a paradigm, method, methodology or research approach? How should we consider epistemology, ontology, and worldview in relation to RtD? Is RtD a form of inquiry in itself or a blend of research methods from engineering, the social sciences, humanities, and the arts? When does RtD stop being RtD? Is RtD necessarily academic? What are the limits of RtD?
2. **Knowledge** – discussion regarding knowledge used and produced in RtD.
   Associated questions: How is knowledge used and generated in RtD? What forms does knowledge take (e.g. guidelines, critique, propositions)? What is the generated knowledge about? How specific is this knowledge and how to make it transferable to other contexts and disciplines?
3. **Designer/researcher** – discussion regarding ideals, mindset, roles, and skills of designers/researchers in RtD.
   Associated questions: How do the ideals, mindset, and skills of designers/researchers play a role in a RtD process? To what extent do these characteristics affect the outcomes of RtD? What roles do designers/researchers take in RtD projects (e.g. analyst, maker, mediator, critic)?
4. **Process** – discussion regarding how design and research activities are related and structured in RtD.
   Associated questions: How do design and research activities relate to each other in an RtD process (e.g. are these sequential or parallel)? How are these activities structured and temporally arranged in RtD practice? What are effective tools and methods to structure and document RtD activities?
5. **Quality** – discussion regarding understanding and assessing quality in RtD.
   Associated questions: How do we deal with quality in RtD? What design and research criteria can we use to determine the quality of an RtD project? How do questions of quality in RtD compare to other disciplines or research approaches?
6. **Artefacts** – discussion regarding roles, nature, and positioning of artefacts in RtD.
   Associated questions: What roles do artefacts play in RtD (e.g. as demonstrators, physical hypotheses, future proposals, or boundary objects)? What kind of artefacts are used in RtD (e.g. dynamic – static; tangible – intangible; finished – unfinished; high/low fidelity)?
7. **Research questions** – discussion regarding role, type, timing, and purpose of research questions in RtD.
   Associated questions: What is the role of research questions in RtD? How do research questions relate to design briefs and goals? When and how are research questions articulated (e.g. at the outset of an RtD project, or do they emerge/evolve during an RtD project)? What types of research questions are asked in RtD? (e.g. ‘how to’, ‘what if’, ‘what might be’, or ‘what ought to be’)?

8. **Participation** – discussion regarding various types and reasons for participation of people in RtD.
   Associated questions: How are people other than the designers/researchers (e.g. users, stakeholders, problem owners, citizens) engaged in RtD? What different roles can people take in RtD (e.g., research subjects, collaborators, end-users, beneficiaries of research outcomes)?
9. **Impact** – discussion regarding impact of RtD on design, research, and society.
   Associated questions: How does RtD contribute to the design discipline? How can RtD contribute to other disciplines of research and practice? How can RtD uniquely impact society? Who is affected by RtD? How are outcomes of RtD disseminated?
10. **Making** – discussion regarding the role, contribution, and documentation of making in RtD.
    Associated questions: What constitutes making in RtD (e.g. preparing stimuli, as a knowledge-generating process in itself, a process to reflect upon, proposing novelty)? How does making contribute to generating knowledge? How to document making processes and outcomes?
11. **Project context** – discussion regarding domains and contexts in which RtD takes place.
    Associated questions: How do different domains (e.g. healthcare, sustainability, or mobility) and contexts (e.g. hospital, home environment, airport) require different approaches to RtD? What are the differences between RtD projects in academia or in industry?

3.2 The final RtD LabTalk: reflecting on the themes

The purpose of the final RtD LabTalk was to have a meta-reflection on the 11 identified themes. In this section, we provide a summary of the discussion that emerged in the final RtD LabTalk. LabTalks 1-7 were characterized by the externalization of thoughts and questions, which resulted in the 11 RtD-related themes. In the final RtD Labtalk, we noticed how these themes served as a structure for participants to discuss their thoughts and questions more deeply – it allowed them to communicate more easily and to align with, or differentiate from, one another. In this way, similarities and differences between participants' way of working became more explicit. For example, during the discussion about 'Quality' one professor pointed out the difficulties of evaluating PhD theses that applied RtD, due to a lack of agreed upon quality criteria. Participants agreed there was a need for such criteria, while suggestions for such criteria were very diverse. Examples were proper documentation, novelty, applicability or usefulness of the generated insights, and the extent to which the work clarifies and evaluates particular characteristics of design examples.

During the final LabTalk we also noticed that when discussing one theme, it often connected to other themes. The discussion on 'Quality', for example, also related to the themes of Philosophy and Process. Themes could thus not be easily discussed separately from one

another, and the discussion was of a more holistic nature. Another thing that stood out during the final LabTalk was the consensus among participants to remain open to a variety of RtD approaches, sharing a sense of *embracing* diversity in RtD. Towards the end of the discussion, the notions of 'styles' and 'genres' were put forth as a way to articulate different RtD approaches. These notions raised enthusiasm and sparked imagination among the participants.

4. Discussion and conclusion

We started this paper with the goal to capture the thoughts and questions that RtD practitioners struggle within their work. We organized these thoughts and questions in an overview of 11 RtD-related themes. Our intention for this overview was not to inform 'our take' on RtD, but rather to start on a different path – one that is open for different points of view on RtD, and one that is grounded in the ongoing concerns and needs of RtD practitioners. We consider the overview of themes as an initial step in such a direction. We are aware that our overview of themes is based on discussions in a particular local academic environment, and we do not claim these themes to be representative of all RtD practitioners, nor this overview to be exhaustive. Our community is based in a university of technology, and it consists of a diverse group of RtD practitioners of different cultural and disciplinary backgrounds. Still, other themes would likely have emerged from, for example, discussions in arts- or humanities-based communities. We return to this issue below, where we describe opportunities for future work. We believe that overviews like the one developed in this paper bring value to the RtD discourse in two ways. First, the identified themes can help in making distinctions between different RtD approaches. Second, the overview points at aspects of RtD that are currently little discussed in the literature. We discuss these contributions in the subsections below and conclude the paper with opportunities for future work.

4.1 Using the themes to distinguish different RtD approaches

A way to grapple with diversity in RtD is to differentiate between different approaches to RtD. We suggest that the 11 RtD-related themes can be helpful in this respect. On a general level, the themes focus our attention to particular areas of similarities and differences. More specifically we suggest seeing the themes as *dimensions* along which RtD approaches differ. Take, for example, the theme of 'Artefacts'. Artefacts can play a variety of roles in RtD (e.g. see Stappers, 2014), and these roles could potentially be useful to characterize particular RtD approaches – artefacts in a 'showroom' serve a different purpose than in the 'field' or 'lab' (Koskinen et al., 2011). Similarly, approaches are likely to differ in terms of their 'Process', ranging from more structured approaches (e.g. Keyson & Bruns Alonso, 2009) to approaches that are described as continuously adjusting or 'drifting' (e.g. see Krogh et al., 2015).

The above themes can be valuable for RtD practitioners in making sense of diversity in RtD in two ways. First, individual RtD practitioners may find the overview of themes useful in trying to develop or make sense of their particular way of doing design as part of doing research. For example, the themes can serve as general considerations that they otherwise

may overlook. Beyond their utility for individuals, we suggest the themes can serve a particularly valuable role in facilitating group discussions about similarities and differences between RtD approaches. Such discussions may eventually inform new categorizations or other developments within RtD. In existing categorizations, the dimensions used for making distinctions have not always been specified. We suggest that the step of explicitly defining such dimensions is a crucial requisite before categorization.

4.2 Contribution of the themes to the RtD discourse

A wide variety of topics have been covered in the RtD discourse, and we see that most of the 11 themes identified in this paper are addressed to a large extent. For example, 'Philosophy' is discussed in terms of what RtD is (e.g. Jonas, 2006; Zimmerman et al., 2010) and what could act as epistemological foundations for RtD (e.g. Dixon, 2019; Isley & Rider, 2018). 'Knowledge' is discussed in the discourse on 'intermediate-level knowledge' (e.g. Höök & Löwgren, 2012; Gaver & Bowers, 2012) and in terms of how RtD generates knowledge (e.g. Markussen et al., 2017; Redström, 2017). Also 'Artefacts' (e.g. Zimmerman & Forlizzi, 2008; Odom et al., 2016), 'Process' (e.g. Basballe & Haskov, 2012; Stappers et al., 2017), 'Quality' (e.g. Biggs & Büchler, 2007; Fallman & Stolterman, 2010), 'Impact' (e.g. Durrant et al., 2015; Koskinen & Krogh, 2015), and 'Making' (e.g. Mäkelä, 2007; Löwgren, 2016) are addressed in the literature. This coverage could be seen as a reassuring sign, telling us that the thoughts and questions that practitioners have been considered in the literature to a large extent. However, our discussion so far has mainly focused on the generic themes that we identified. Whether the particular questions that make up the themes have sufficiently been addressed in the literature is uncertain. It is beyond the scope of this paper to make a statement in this regard. Instead, we encourage authors that address one or more of the 11 themes to consider using the particular questions summarized in Section 3.1 to inform their work.

Four of the themes of our overview are, to the best of our knowledge, still underemphasized in RtD literature. The first is 'Participation' – while many participatory design projects can be considered as a form of RtD, such work is not often discussed in RtD-related papers. We see signs that this theme is of interest and relevance, as several authors adopt the term 'research through co-design' (e.g. Ricci & Scataglini, 2020), positioning participation at the center of their RtD approach. Furthermore, the themes of 'Designer/researcher', 'Research questions' and 'Project context' are very little discussed in the RtD literature, although with exceptions. For 'Designer/researcher' see Sleeswijk Visser (2018) on the different roles that designers/researchers take in RtD. For 'Research questions', see Findeli (2010), Brandt & Binder (2007), and Bang et al. (2012). Finally, for 'Project context', see Boess (2009) on the situatedness of RtD. We believe these four aforementioned themes require more attention in the RtD discourse.

4.3 Future work: Towards 'styles' and 'genres' of RtD

At the outset of this paper we stated that, rather than proposing yet another categorization of RtD from our particular perspective, we start on a different path – 'one that is open for different points of view and grounded in the ongoing concerns, needs and practices of RtD

practitioners'. Our contribution can be considered as an initial step in this direction. We see two main opportunities for future work.

A first opportunity is to continue discussions according to the approach taken in this paper, and to engage a broader range of RtD practitioners in sharing thoughts and questions about RtD. Such discussions can enhance the overview of themes developed in this paper. Moreover, we suggest the process of sharing thoughts and questions is valuable in its own right. It allows RtD practitioners from different backgrounds to learn from one another and to get a grip on the variety of approaches that RtD practitioners are taking in their work. We suggest conferences such as the RTD, DRS, CHI and DIS conferences, are an ideal venue for such purposes, as they typically bring together such a diverse community.

A second opportunity concerns the distinguishing of different RtD approaches. During the final RtD LabTalk (see Section 3.2), the notions of 'styles' and 'genres' were proposed to serve this purpose. We share the enthusiasm that participants had for these notions, and see them as a promising way forward to grapple with diversity. We envision 'genres' of RtD as more general categories that come with certain agreed-upon conventions – much of the related work discussed in the introduction addresses diversity on this level (e.g. Koskinen et al., 2011; Forlizzi et al., 2018). 'Styles' refer more to the particular ways of working of individual RtD practitioners or research groups – we feel that there can be more discussion on this level. Here is where similarities and differences can be articulated in a more granular way, close to RtD practitioners' everyday practice, and close to their needs and preferences. We propose that the notions of 'styles' and 'genres' can form the basis for a shared language for the RtD community – a consistent language that is currently missing (Stappers & Giaccardi, 2017). A consistent language requires conceptualizing the two notions further, building on theory and a strong engagement with RtD practice. Developing such a *shared* language will require discussions that cross-disciplinary and institutional boundaries. We hope to organize and participate in such discussions in the future to collaboratively understand and embrace the diversity that marks the RtD discourse.

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5. References

Andersen, K., Boucher, A., Chatting, D., Desjardins, A., Devendorf, L., Gaver, W., Jenkins, T., Odom, W., Pierce, J., & Vallgårda, A. (2019). Doing Things with Research through Design: With What, Whom, and Towards What Ends? In Brewster, S., & Fitzpatrick, G. (Eds.). (2019). *Proceedings of CHI '19: Weaving the Threads of CHI*, No. W13, pp. 1-8. https://doi.org/10.1145/3290607.3299011

Baha, S. E., Dawdy, G., Sturkenboom N., Price, R. A., & Snelders, H. M. J. J. (2018). Good Design-Driven Innovation. In Storni, C., Leahy, K., McMahon, M., Bohemia, E. and Lloyd, P. (Eds.). (2018). *Proceedings of DRS 2018: Catalyst*, Vol. 1, pp. 98-111. https://doi.org/10.21606/dma.2017.648

Bang, A., Krogh, P., Ludvigsen, M., & Markussen, T. (2012). The Role of Hypothesis in Constructive Design Research. In *Proceedings of The Art of Research IV: Making, Reflecting and Understanding*, pp. 1–11.

Bardzell, J. (2019). Design Researchers Need a Shared Program, Not a Divorce. *Interactions*, 26(2), 22–23. http://doi.org/10.1145/3306464

Basballe, D. A., & Halskov, K. (2012). Dynamics of Research through Design. In *Proceedings of DIS '12*, pp. 58–67. https://doi.org/10.1145/2317956.2317967

Bendor, R., Maggs, D., Peake, R., Robinson, J., & Williams, S. (2017). The imaginary worlds of sustainability. *Ecology and Society*, 22(2), Art. 17. https://doi.org/10.5751/ES-09240-220217

Biggs, M. A. R., & Büchler, D. (2007). Rigor and Practice-based Research. *Design Issues*, 23(3), 62-69. https://www.jstor.org/stable/25224118

Binder, T., & Redström, J. (2006). Exemplary Design Research. In Friedman, K., Love, T., Côrte-Real, E. and Rust, C. (Eds.). (2006). *Proceedings of DRS 2006: Wonderground*. pp. 1-13.

Boess, S. (2009). Designing in Research: Characteristics and Criteria. In Lee, K., Kim, J, & Chen, L. L. (Eds.). (2009). *Proceedings of IASDR 2009: Rigor and Relevance in Design*, pp. 4535-4547.

Brandt, E., & Binder, T. (2007). Experimental design research: Genealogy, intervention, argument. In Poggenpohl, S. (Ed.). (2007). *Proceedings of IASDR 2007: Emerging Trends in Design Research*, Vol. 1, pp. 1-17.

Chow, R. (2010). What Should be done with the Different Versions of Research Through Design, in Mareis, C., Joost, G. and Kimpel, K. (Eds.), *Entwerfen - Wissen - Produzieren: Designforschung im Anwendungskontext*, Transcript Verlag, pp. 145-158.

Dixon, B. (2019). Experiments in Experience: Towards an Alignment of Research through Design and John Dewey's Pragmatism. *Design Issues*, 35(2), 5-16. https://doi.org/10.1162/desi_a_00531

D'Olivo, P., Rozendaal, M. C., & Giaccardi, E. (2017). AscoltaMe: Retracing the Computational Expressivity of a Tactful Object for Sensitive Settings. In Mival, O., Smyth, M., & Dalsgaard, P. (Eds.). (2017). *Proceedings DIS '17, pp.* 943-955. https://doi.org/10.1145/3064663.3064801

Dow, S., Ju, W., & Mackay, W. (2013). Projection, Place and Point-of-view in Research through Design, in Price, S., Jewitt, C. and Brown, B. (Eds.), *The SAGE Handbook of Digital Technology Research*, SAGE Publications Ltd., pp. 266-285. http://doi.org/4135/9781446282229.n19

Durrant, A. C., Vines, J., Wallace, J., & Yee, J. (2015). Developing a Dialogical Platform for Disseminating Research through Design. *Constructivist Foundations*, 11(1), 8-21. http://constructivist.info/11/1/008.durrant

Fallman, D., & Stolterman, E. (2010). Establishing criteria of rigour and relevance in interaction design research. *Digital Creativity*, 21(4), 265-272. https://doi.org/10.1080/14626268.2010.548869

Findeli, A. (2010). Searching For Design Research Questions: Some Conceptual Clarifications, in Chow, R., Joost, G. and Jonas, W. (eds.), *Questions, Hypotheses & Conjectures*, iUniverse Inc., pp. 286-303.

Forlizzi, J., Zimmerman, J., Hekkert, P., & Koskinen, I. (2018). Let's Get Divorced: Constructing Knowledge Outcomes for Critical Design and Constructive Design Research. In Koskinen, I., & Lim, Y. K. (Eds.). (2018). *Proceedings of DIS '18,* pp. 395–397. http://doi.org/10.1145/3197391.3197395

Forlizzi, J., Stolterman, E., & Zimmerman, J. (2009). From Design Research to Theory - Evidence of a Maturing Field. In Lee, K., Kim, J, & Chen, L. L. (Eds.). (2009). *Proceedings of IASDR 2009: Rigor and Relevance in Design*, pp. 2889-2898.

Frayling, C. (1993). Research in Art and Design. *Royal College of Art Research Papers*, 1(1), 1-5. http://www.opengrey.eu/handle/10068/492065

Gaver, W. W., & Bowers, J. (2012). Annotated Portfolios. *Interactions*, 19(4), 40. http://doi.org/10.1145/2212877.2212889

Giaccardi, E. (2019). Histories and Futures of Research through Design: From Prototypes to Connected Things. *International Journal of Design*, 13(3), 139-155. http://www.ijdesign.org/index.php/IJDesign/article/view/3192/875

Godin, D. & Zahedi, M. (2014). Aspects of Research through Design: A Literature Review. In Lim, Y., Niedderer, K., Redström, J., Stolterman, E., and Valtonen, A. (Eds.). (2014). *Proceedings of DRS 2014: Design's Big Debates*, Vol. 1, pp. 1667-1680.

Höök, K., & Löwgren, J. (2012). Strong concepts. *ACM Transactions on Computer-Human Interaction*, 19(3), 1-18. https://doi.org/10.1145/2362364.2362371

Isley, C. G., & Rider, T. (2018). Research-Through-Design: Exploring a design-based research paradigm through its ontology, epistemology, and methodology. In Storni, C., Leahy, K., McMahon, M., Bohemia, E. and Lloyd, P. (Eds.). (2018). *Proceedings of DRS 2018: Catalyst* , Vol. 1, pp. 357-367. http://doi.org/10.21606/drs.2018.263

Jonas, W. (2006). Research through DESIGN through research - a problem statement and a conceptual sketch. *Society*, 36(1), 1-8. https://doi.org/10.1108/03684920710827355

Keyson, D. V., & Bruns Alonso, M. (2009). Empirical Research Through Design. In Lee, K., Kim, J, & Chen, L. L. (Eds.). (2009). *Proceedings of IASDR 2009: Rigor and Relevance in Design*, pp. 4548-4557.

Kawakita, J. (1991). *The Original KJ Method*. Kawakita Research Institute.

Koskinen, I., & Krogh, P. G. (2015). Design accountability: When design research entangles theory and practice. *International Journal of Design*, 9(1), 121-127. http://www.ijdesign.org/index.php/IJDesign/article/view/1799/681

Koskinen, I., Zimmerman, J., Binder, T., Redström, J., & Wensveen, S. (2011). *Design Research Through Practice: From the Lab, Field, and Showroom*. Elsevier Inc.

Krogh, P. G., Markussen, T., & Bang, A. L. (2015). Ways of Drifting—Five Methods of Experimentation in Research Through Design. In Chakrabarti, A. (Ed.). (2015). *Proceedings of ICoRD' 15: Research into Design Across Boundaries*, Vol. 1, pp. 39-50. https://doi.org/10.1007/978-81-322-2232-3_4

Lenzholzer, S., Duchhart, I., & Koh, J. (2013). 'Research through designing' in landscape architecture. *Landscape and Urban Planning*, 113, 120-127. https://doi.org/10.1016/j.landurbplan.2013.02.003

Löwgren, J. (2016). On the Significance of Making in Interaction Design Research. *Interactions*, 23(3), 26-33. https://doi.org/10.1145/2904376

Mäkelä, M. (2007). Knowing Through Making: The Role of the Artefact in Practice-led Research. *Knowledge, Technology & Policy*, 20, 157-163. https://doi.org/10.1007/s12130-007-9028-2

Markussen, T. (2017). Building Theory through Design, in Vaughan, L. (Ed.), *Practice-Based Design Research*, Bloomsbury Academic, pp. 87-98.

Odom, W., Wakkary, R., Lim, Y., Desjardins, A., Hengeveld, B., & Banks, R. (2016). From Research Prototype to Research Product. In Kaye, J., & Druin, A. (Eds.). (2016). *Proceedings of CHI '16*, pp. 2549-2561. https://doi.org/10.1145/2858036.2858447

Redström, J. (2017). *Making Design Theory*. The MIT Press.

Ricci, D. B., & Scataglini, S. (2020). A Co-model for Research Through Co-design, in Di Nicolantonio M., Rossi E. and Alexander T. (Eds.), *Advances in Additive Manufacturing, Modeling Systems and 3D Prototyping*, Springer Cham., pp. 595-602. https://doi.org/10.1007/978-3-030-20216-3_55

Research Through Design Conference series website. N.d. *Method & Critique: RTD 2019*. Retrieved from: https://www.researchthroughdesign.org/news/method-critique-rtd-2019/

Singh, A. (2011a). Visual artefacts as boundary objects in participatory research paradigm. *Journal of Visual Art Practice*, 10(1), 35-50. https://doi.org/10.1386/jvap.10.1.35_1

Singh, A. (2011b). Collaborative videoing - a reflexive account. In Roozenburg, N. F. M., Chen, L. L. and Stappers, P.J. (Eds.). (2011). *Proceedings of IASDR 2011: Diversity and Unity*. https://doi.org/10.13140/2.1.1313.1521

Sleeswijk Visser, F. (2018). Structuring roles in Research through Design collaboration. In Storni, C., Leahy, K., McMahon, M., Bohemia, E. and Lloyd, P. (Eds.). *Proceedings of DRS 2018: Catalyst,* Vol. 1, pp. 368-380. https://doi.org/10.21606/drs.2018.297

Stappers, P. J. (2014). Prototypes as central vein for knowledge development, in Valentine, L. (Ed.), *Prototype: Design and craft in the 21st century*, Bloomsbury, pp. 95-97.

Stappers, P. J., & Giaccardi, E. (2017). Research through Design, in *The Encyclopedia of Human-Computer Interaction* (2nd Ed.), Interaction Design Foundation, Vol. 32, pp. 1-74.

Stappers, P. J., Keller, I., & Sleeswijk Visser, F. (2015). The role of prototypes and frameworks for structuring explorations by research through design, in Rodgers, P. A. and Yee, J. (Eds.), *The Routledge Companion to Design Research*, Routledge, pp. 167-174.

Vermeeren, A. P. O. S., Roto, V., & Väänänen, K. (2016). Design-inclusive UX research: design as a part of doing user experience research. *Behaviour & Information Technology*, 35(1), 21-37. https://doi.org/10.1080/0144929X.2015.1081292

Zimmerman, J., & Forlizzi, J. (2008). The Role of Design Artifacts in Design Theory Construction. *Artifact*, 2(1), 41-45. https://doi.org/10.1080/17493460802276893

About the Authors:

Boudewijn Boon is a postdoctoral design researcher at the Food and Eating Design Lab, TU Delft. He is an active practitioner and advocate of 'research through design'.

Ehsan Baha is a design practitioner, researcher, and educator. He is the founder of Meaningwise – a design consultancy specialized in Good Design-Driven Innovation. Ehsan is investigating designer identity as a foundation for pluralism in design.

Abhigyan Singh is a postdoctoral researcher at the Faculty of Industrial Design Engineering, TU Delft. He is a transdisciplinary researcher who explores the mutual confluence of design, anthropology, energy studies, and emerging technologies.

Frithjof Wegener is a PhD candidate at the TU Delft. He employs process ontology and pragmatist epistemology to develop new research methodologies. He explores how to do pragmatist research through design, where design, process, and inquiry become core of the research practice.

Marco Rozendaal is assistant professor of Interaction Design. In his work, he explores new interaction design paradigms engendered by emerging technologies, such as the IoT and AI, to understand their social opportunities and ethical implications.

Pieter Jan Stappers is professor of Design Techniques, focusing on tools and techniques to support designers in the early phases of the design process. His publications focus on the topics of user research, especially 'contextmapping', and research through design methodology.