Design as continuous repair

Experimentation, negotiation, and expertise in DIY spaces

Philip Hector
Design as continuous repair

Experimentation, negotiation, and expertise in DIY spaces

Philip Hector
Supervising professor
Mikko Jalas, Aalto University, Finland

Thesis advisor
Cindy Kohtala, Aalto University, Finland

Preliminary examiners
Joanna Saad-Sulonen, IT University Copenhagen, Denmark
Sabine Hielescher, University of Sussex, United Kingdom, and TU Berlin, Germany

Opponent
Joanna Saad-Sulonen, IT-University Copenhagen, Denmark

Aalto University publication series
DOCTORAL DISSERTATIONS 84/2021

© 2021 Philip Hector

ISBN 978-952-64-0422-6 (pdf)
ISSN 1799-4934 (printed)
ISSN 1799-4942 (pdf)

Unigrafia Oy
Helsinki 2021

Finland
Abstract

With the phenomenon of citizen engagement at alternative production and consumption spaces proliferating, this dissertation presents analysis from the perspectives of participatory design (PD) and science and technology studies (STS) to investigate how these spaces are established and sustained as infrastructures for a 'make, test, and repair' culture. Employing semi-structured interviews and participant observation with seven 'DIY spaces' this study asks 'what forms of design are enacted, and how do they support reproduction of the space and circulation of socio-material resources?' and 'how do these resources affect the negotiation of relevance and expertise at participant, collective, and institution level?'

The dissertation highlights the spaces' nature as emergent and relational infrastructures providing access to workshop equipment, knowledge, social meeting places, and ways of materially pursuing utopian ideals. The material engagements span a broad range, from products' adaptation for local settings to, for more invested practitioners, means of collective organising such as negotiation of decision-making tools and responsibilities. While most are far from radical, the engagements are shown to be demonstrations that things might be otherwise – a form of ongoing, immediate future-making. Be they products, guidelines, or visualisations, these demonstrations further matter for stabilising experimental sites that, being in 'constant beta mode', mirror on organisation level the DIY ethos present at the level of the individual.

Accordingly, they also constitute continuous repair. In particular, the inventive work of invested actors often is evidenced in adjustment to local settings that require maintenance and repair. The research elucidated two key mechanisms whereby others gain room to engage in DIY practices: organisers apply workarounds (repurposing of material settings, including spaces, objects, and official forms) and engage in infrastructuring alliances, whereby emerging needs and opportunities of several actors get aligned. Simultaneously, the institutional and other actors involved employ workarounds as a part of informal institutional work, demonstrating that institutions too are sites of active change. The research highlights that the repairs are not a return to any fixed, static state but ongoing, even generative processes that, in turn, influence the actors.

In line with STS analyses of expertise as reliant on audiences, the dissertation argues that the DIY spaces must display relevance to those institutions and intermediaries able to grant them resources such as space, tools, and knowledge of bureaucratic procedure. With mutual relevance established, institutional actors can gain access to relevant local networks and environmental or production-related expertise. Some DIY spaces engage with similar initiatives, thereby increasing in local relevance, or even operate under an intermediary institution that provides further resources such as third-party insurance. The socio-materiel resources and material demonstrations therefore are a crucial element of the negotiation of expertise and actors’ intertwined relations.

Keywords DIY spaces, institutions, experiments, design, repair, sustainability

ISSN (printed) 1799-4934  ISSN (pdf) 1799-4942

Location of publisher Helsinki  Location of printing Helsinki  Year 2021
Acknowledgements

Firstly, I wish to thank all those wonderful people out there who strive to imagine and create better places, and who take the time to answer the questions of random researchers such as I.

I want to thank my supervisor and adviser, Mikko Jalas, for accompanying me over a span of more than four years. Whether for sharing your curiosity about how people and things relate to one another, leaving me space to explore concepts that matter to me, serving as a sounding board for many confusions along the way, keeping me calm at conference visits, or supporting me with teaching engagements and funding applications, I could not have hoped for a better supervisor. Needless to say, practising theories of a good life in the form of sailing or harnessing wind power has definitely helped me to persist until the printing of this book.

In connection with this freedom to explore, I am grateful that Cindy Kohtala served as my adviser for the second half of the process. Besides sharing my interest in open design and decentralised organising, your level of rigour with regard to data collection and analysis gave me much-needed confidence. Along with this, your careful way of writing and your consideration for everyone else involved in the research process is inspiring.

I would also like to thank my pre-examiners Joanna Saad-Sulonen and Sabine Hielscher for taking time to engage with my dissertation and providing critical yet valuable comments that helped me to better articulate my thoughts.

Rounding out my emergency support team has been Andrea Botero. Since the beginning of my studies, you have taken time to listen to and
comfort me amid my crises of faith that followed moving from a design BA and MA to a PhD student’s life revolving around a myriad of social-science concepts I had never encountered before. Your way of combining the two fields has been a helpful guide. The reminder of the usefulness of scribbles will stick with me especially.

Over the past four years, I have found my first full-time work colleagues at the university’s design department. Of particular importance has been the NODUS research group, with İdil Gazıulusoy, Eeva Berglund, Michael Lettenmeier, Elise Hodson, Tatu Marttila, Elif Öztekin, Hella Hernberg, Kata Fodor, Emilija Veselova, and – most of all – my former flatmate Maria Ferreira Litowtschenko and my ‘partner in crime’ on the topic of my dissertation Anja-Lisa Hirscher. Thank you for the many shared discussions, lunches, and laughs; this environment will be hard to beat. Besides the excellent PhD-level peer support within NODUS, I want to emphasise my appreciation for the co-operative spirit among all the doctoral students. Such an atmosphere is truly rare. In particular, Essi, Kaisu, Marium, Bilge, Nathalia, and Andrea have shared the ups and downs throughout and provided plenty of perspectives.

Other researchers shaping and supporting my development I found in Sampsa Hyysalo, who has given me great hints on where to dig more deeply; Yana Boeva, whose thesis proved eye-opening with regard to intersections between the design and STS disciplines; and, finally, Morgan Meyer, whom I met at my very first conference and whose writings and suggestions during my visit to MINES ParisTech shaped my understanding of STS and DIY in invaluable ways.

To my long-time friends Daniel and Tere, who have remained close to me as part of the city’s surprisingly large Latin community, thank you for the flavour and dark humour over my more than six years in Helsinki. Elise, Ulla, and Paula, thank you all for taking me to forests, saunas, cabins, and events, and for making me feel a little bit like a Finn. Having lived abroad for almost the whole of the 2010s, I would also like to thank my friends dotted around mainland Europe for the many visits and phone calls. Most of all, the sauna-building and cabin-planning with Zeno, Peter, and Jonas helped me stay happy. A few old lamps and bikes, with their urge to be repaired, have likewise helped me keep going. In the final stage, printing this book was possible thanks to Gaspar who helped me with the graphic
design and Johannes who joined several ideation sessions on the title.

Over my many years away from my roots, I have always maintained several homes, where I could visit my family: Susi and Uwe, Maria and Veronica, and my partner Lisanne. Thank you for being there for me and at times challenging my stubborn self to take an alternative perspective.

Finally, I want to thank Finland – what a wonderful place you are!
Abstract

With the phenomenon of citizen engagement at alternative production and consumption spaces proliferating, this dissertation presents analysis from the perspectives of participatory design (PD) and science and technology studies (STS) to investigate how these spaces are established and sustained as infrastructures for a ‘make, test, and repair’ culture. Employing semi-structured interviews and participant observation with seven ‘DIY spaces’ this study asks ‘what forms of design are enacted, and how do they support reproduction of the space and circulation of socio-material resources?’ and ‘how do these resources affect the negotiation of relevance and expertise at individual, collective, and institution level?’

The dissertation highlights the spaces’ nature as emergent and relational infrastructures providing access to workshop equipment, knowledge, social meeting places, and ways of materially pursuing utopian ideals. The material engagements span a broad range, from products’ adaptation for local settings to, for more invested practitioners, means of collective organising such as negotiation of decision-making tools and responsibilities. While most are far from radical, the engagements are shown to be demonstrations that things might be otherwise – a form of ongoing, immediate future-making. Be they products, guidelines, or visualisations, these demonstrations further matter for stabilising experimental sites that, being in ‘constant beta mode’, mirror on organisation level the DIY ethos present at the level of the individual.

Accordingly, they also constitute continuous repair. In particular, the inventive work of invested actors often is evidenced in adjustment to local
settings that require maintenance and repair. The research elucidated two key mechanisms whereby others gain room to engage in DIY practices: organisers apply workarounds (repurposing of material settings, including spaces, objects, and official forms) and engage in infrastructuring alliances, whereby emerging needs and opportunities of several actors get aligned. Simultaneously, the institutional and other actors involved employ workarounds as a part of informal institutional work, demonstrating that institutions too are sites of active change. The research highlights that the repairs are not a return to any fixed, static state but ongoing, even generative processes that, in turn, influence the actors.

In line with STS analyses of expertise as reliant on audiences, the dissertation argues that the DIY spaces must display relevance to those institutions and intermediaries able to grant them resources such as space, tools, and knowledge of bureaucratic procedure. With mutual relevance established, institutional actors can gain access to relevant local networks and environmental or production-related expertise. Some DIY spaces engage with similar initiatives, thereby increasing in local relevance, or even operate under an intermediary institution that provides further resources such as third-party insurance. The socio-material resources and material demonstrations therefore are a crucial element of the negotiation of expertise and actors’ intertwined relations.

The dissertation highlights the inventive work whereby citizens and administrative officials negotiate and produce knowledge and infrastructure around a ‘make, test, and repair’ culture. Consequently, it articulates a PD practice that, inspired by repairing of socio-material surroundings, foregrounds both the resources at hand and the (often invisible and seemingly trivial) important work/workers vital for the circulation and rearrangement of those resources.
List of original articles

The following original publications form an integral part of the doctoral thesis. Referred to in the text as publications 1–4, these papers are reproduced in their original form by permission of the publishers.

Publication 1

Publication 2
Hector, Philip and Mikko Jalas. 2019. ‘What matters when turning utopias into material.’ *NORDES* (8).

Publication 3

Publication 4
Author’s contributions

**Publication 1**: Sole author. The journal article consists of a literature review on historic perceptions of DIY endeavours, complemented with a report on ethnographic research conducted at three sites.

**Publication 2**: First author. The conference publication presents an in-depth case study of a single DIY space. I conducted and transcribed all interviews, and I handled preparations for the first round of coding. Subsequent analysis rounds and writing involved a collaborative process in which I acted as the lead author.

**Publication 3**: First author. The journal publication continues the examination of the case study addressed in P2. Except for one key interviewee, with whom I was closely acquainted at a personal level, I conducted and transcribed all interviews and conducted preparations for the first-stage coding. Subsequent iterations of analysis and writing entailed collaboration wherein I was the lead author.

**Publication 4**: First author. The journal publication comprises an in-depth case study of a DIY space and its relations to surrounding actors. I conducted and transcribed all of the interviews, and I handled the first-round coding. Further analysis iterations and writing constituted collaborative work for which I served as the lead author.
List of figures and tables

**Figure 1:** Positioning of the research papers p.17  
**Figure 2:** Forms of generative repair p.83  
**Figure 3:** Tensions in DIY spaces p.88  

**Table 1:** Genres of spaces related to DIY p.14  
**Table 2:** Research foundations p.18  
**Table 3:** Relations between research gaps and portions of the discussion p.22  
**Table 4:** Characteristics of the sites p.55  
**Table 5:** Collection of the data p.58
Table of contents

Acknowledgements -- 1
Abstract -- 4
List of original articles -- 6
Author's contributions -- 7
List of figures and tables -- 8

1. Introduction
1.1. Background -- 12
1.2. The focus of the project and the research questions -- 16
1.3. The structure of the dissertation -- 18

2. The making and repair of objects and collectives
2.1. Engagement with the everyday through material means -- 23
2.1.1. Blurring of boundaries: DIY bridging expert and amateur, design and repair -- 24
2.1.2. New Materialism: The politics of collective material engagement -- 30
2.2. Consolidation and reworking of collectives for the everyday -- 37
2.2.1. Infrastructuring: Collectives’ socio-material endurance over time -- 37
2.2.2. Relevance: How collectives and institutions negotiate expertise -- 43

3. Methodology
3.1. Research foundations -- 50
3.2. The data-collection process -- 52
3.3. Data analysis -- 60
4. Summary of the research articles
4.1. Organising places for making and repairing -- 64
4.2. Making utopias material -- 67
4.3. Experimenting with sustainability education outdoors -- 69
4.4. Repair in between DIY spaces and institutions -- 71

5. Discussing design as continuous repair
5.1. Relational infrastructures in constant beta mode -- 76
5.2. Design with immediacy, workarounds and matchmaking -- 80
5.3. Individual-level learning, collective negotiation, and institutional legitimacy -- 86
5.4. The contributions in summary -- 92

6. Conclusions
6.1. Implications for actors involved in a ‘make, test, and repair’ culture -- 96
6.2. Implications for design research and education -- 99
6.3. Limitations and further research avenues -- 101

Bibliography -- 106
Appendix A: The interview guides -- 126
Appendix B: Additional research material -- 128
Publication 1 -- 130
Publication 2 -- 142
Publication 3 -- 152
Publication 4 -- 170
1. Introduction

This chapter begins with an overview of the DIY phenomenon including a taxonomy of existing genres and a list of limitations currently discussed in the literature. Then, Section 1.2. presents the specific research questions to address said gaps in the literature and lays out how the four publications that form the base of this dissertation relate to each other. Finally, I conclude with a brief summary of the structure of the overall thesis.

1.1. Background

The phenomenon of citizens engaging with alternative production and consumption sites such as ‘open workshops’ or ‘repair cafés’ is proliferating rapidly. An example is Germany’s Verbund Offene Werkstätten, or Open Workshop Association (OWA), with which collaborating citizens have built a network of more than 200 workshops commencing operations over the last decade. One part of this development, namely practices related to ‘making’ or do-it-yourself (DIY) activities, is receiving increased scholarly attention, especially in the Global North (Iveson 2013). The literature’s portrayals, especially of forms going by names such as ‘fab lab’ or ‘maker space’, have been welcomed by policy-makers in a manner that supports the discourses of individual-level empowerment or local economic growth, which are sparsely documented in this domain (cf. Turner 2018). At the
same time, several authors have highlighted these sites as places of social connection, mediated by material engagement (cf. Bogers and Chiappini 2019); as sites of ongoing experimentation and learning within and against the ordered space of the city (Wendler 2014); or as a re-politicisation of everyday consumption practices (Beveridge and Koch 2019). Hence, within the broader development of dedicated DIY sites, there are forms that often link themselves to socio-ecological change agendas set in situated, local dynamics. Therefore, they serve further analysis of how people materially engage with their surroundings to demonstrate that things can be otherwise, and they require further conceptualisation related to their emergence and endurance and to negotiation of their use, expertise, and societal relevance.

Indeed, the DIY phenomenon *per se* is far from new and satisfies a variety of needs, including resourcefulness, self-development, and leisure time (Atkinson 2006). It also challenges binary distinctions such as production/consumption (Ritzer and Jurgenson 2010) and experts/amateurs (Meyer 2013). In this regard, researchers from diverse fields, among them design, science and technologies studies (STS), and sociology of consumption, are increasingly taking serious how laypersons contribute to the shaping of our environment. Consequently, scholars have integrated and mapped the endeavours of these everyday experts along a continuum that features use, repair, adaptation, and innovation (cf. Kohtala et al. 2020). The underlying process of becoming an expert in material engagement is not purely a matter of learning through trial and error in real-world problem settings (Dewey 2004 [1916]) and bodily routinised experience (Gherardi 2009), however; it depends equally on how external entities – such as policy- and decision-makers – consider knowledge relevant (Rip 2003).

The above becomes especially relevant in moving beyond definitions of DIY as private forms of material engagement, to consider also organised collectives that function in opposition to commercial practice (Hyysalo et al. 2013). Such collective forms require analyses of where and how knowledge and expertise get negotiated. While some specific forms, such as fab labs and maker spaces, have been covered extensively (Kohtala 2016; Boeva 2018) and received widespread attention in the policy arena (cf. Turner 2018), others, such as repair sites (Graziano and Trogal 2017) and even less formal types of collective DIY (Bialski et al. 2015), remain at the margins
of policy-making (for a list of genres, see Table 1, below). Schlosberg and

<table>
<thead>
<tr>
<th>Genre</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bike kitchen</td>
<td>A non-profit space where people can use the space and tools to repair or build bicycles, separately or together (per Bradley 2018)</td>
</tr>
<tr>
<td>Fab lab</td>
<td>A space, organised through a central charter, that supports invention through open access to digital fabrication tools (per Kohtala 2016)</td>
</tr>
<tr>
<td>Hacker Space</td>
<td>A community workshop, usually in a rented location, where people interested in technology can socialise and learn (per Maxigas 2012)</td>
</tr>
<tr>
<td>Hack lab</td>
<td>A volunteer-run space, usually in a squat or autonomous facility, providing free access to computers and the Internet (per Maxigas 2012)</td>
</tr>
<tr>
<td>Maker space</td>
<td>A space where people can meet to share knowledge and tools for fabrication; proponents claim that everyone is a maker (per Foster 2017)</td>
</tr>
<tr>
<td>Open workshop</td>
<td>An open space where people can use tools and infrastructure, with organisation by a not-for-profit association (per Simons et al. 2016)</td>
</tr>
<tr>
<td>Open technology lab</td>
<td>A workshop for creative activities, organised by an Austrian network that supports rural areas (see <a href="http://www.otelo.or.at/">http://www.otelo.or.at/</a>)</td>
</tr>
<tr>
<td>Repair café</td>
<td>Branded by a not-for-profit association, an event to which people can bring broken items and receive guidance (per Graziano and Trogal 2017)</td>
</tr>
<tr>
<td>Sewing café</td>
<td>An event where participants can learn various techniques related to producing and repairing clothing (per Hirscher and Mazé 2019)</td>
</tr>
<tr>
<td>Urban-living lab</td>
<td>A forum intentionally established for multiple actors to test and evaluate sustainability interventions in a city (per Bulkeley et al. 2016)</td>
</tr>
<tr>
<td>Culture lab etc.</td>
<td>Further local versions of collective DIY, not discussed explicitly in the research literature</td>
</tr>
</tbody>
</table>
Coles (2016) have recommended incorporating some of these sites – which focus on making and repairing products for day-to-day use (phones, bicycles, fashion items, etc.) – into the notion of the sustainable materialist movement. These sites differ from more performative types of social movement, which may organise protests, insofar as they create practical infrastructure for collectively managing resources flows. Research into sustainable consumption highlights such collective infrastructure as crucial for offsetting tendencies to push responsibility for structural ‘unsustainability’ onto individual consumers (Seyfang and Smith 2007).

However, there are numerous obstacles to said infrastructure’s emergence and endurance. Firstly, as robust research shows, many meanings are attributed to DIY activities (Atkinson 2006), so we can expect sites to be used for individuals’ leisure time, sociability, and speaking to environmental concerns alike. Furthermore, research on DIY collectives suggests variety in intensity of participation (Meyer 2013), and, in a closely related factor, levels of skill are not evenly distributed among DIYers (cf. Hirscher 2020). For their day-to-day organising, less institutionalised sites need to make do with scarce resources, utilising volunteer workers and appropriating tools that are available (Bødker et al. 2016). Another interesting matter is how DIY spaces deal with the ‘problem of relevance’ (Marres 2012) – how a distributed public (Dewey 2012 [1927]) emerges around and negotiates on a common issue (such as privatised material flows) but, owing to distance from institutional power, cannot resolve it.

In light of these considerations, several research gaps were identified. Firstly, it would be worthwhile to understand the multitude of DIY-linked motivations and concepts both. Secondly, research and practice alike could benefit from richer understanding of the ways in which sites for collective DIY activities are conceptualised: what they are, what they do, how they make use of local surroundings and resource flows, and how they reconcile the differences in use cases and in participation intensity. Thirdly, both the inventive work of members internally and how external actors strive to sustain the sites require fuller understanding, and could be conceptualised as designs by everyday experts, which in turn could benefit current participatory design education. Fourthly, studying interactions with external institutional arrangements can further aid in comprehending both locally bounded DIY spaces and how their abilities to develop outcomes found
relevant by more legitimated actors are part and parcel of expertise.

1.2. The focus of the project and the research questions

Informed by the background and limitations presented above, the doctoral project investigated several sites regarding their collective experimentation on what a ‘make, test, and repair’ culture entails in day-to-day life, alongside the accompanying negotiation. The work highlighted the mundane yet potentially inventive organising work that is crucial for the endurance of the sites. The choice of foci drew from urban-geography and STS research into the role of social learning and collective organising modalities in experiments (cf. Sengers et al. 2016; Wendler 2014); efforts in participatory design (PD) and STS studies to examine the relational and processual aspects of how actors, practices, and infrastructure emerge over time (Karasti 2014); studies that illuminate the oftentimes invisible work ‘backstage’ in collaborative design processes (Bowker and Star 1999; Hyysalo and Hyysalo 2018); and, finally, work on how institutional actors and initiatives negotiate their relevance and, hence, their expertise (cf. Marres 2012; Teli et al. 2020).

Therefore, I developed the following research question:

*How do DIY spaces emerge and endure as everyday, socio-material infrastructure for a ‘make, test, and repair’ culture?*

The question was investigated by means of specific sub-questions:

*What forms of design take shape, and how do they support the reproduction of the space and its socio-material resources?*

*How do socio-material resources affect the negotiation of relevance and expertise at individual, collective, and institution level?*

To convey how I approached these questions, Figure 1 outlines the mutual relationship of the four research articles that constitute the core of the dissertation and how each ties in with the research questions.
Figure 1: Positioning of the research papers

Being grounded in pragmatism, the overall research approach at ontological level emphasises the relational aspects of the practices and underlying infrastructure studied. Furthermore, the research is broad-based, with inspiration from both STS and design understandings, which highlight the importance of materiality and wherein it is considered constitutive to the social world. Multi-sited ethnography was employed in Finland and Germany, across seven sites, which were selected strategically for specific temporal qualities, i.e. they span the emergence or endurance of a site. The two main sites chosen (which I followed for several years), one in Helsinki called ‘Test Site’ and a Berlin site called ‘Trial & Error’ – were considered alongside the five other sites: a site in the Helsinki region dubbed ‘Temporary’; Nähcafe, in Ulm, Germany; and three spaces, in cities near Berlin that are part of the OWA: Hebewerk, Konglomerat, and FabLab Cottbus.

To understand the phenomenon of DIY spaces better, I conducted four studies, with complementary perspectives. These examined the meaning of the engagement to individuals, the internal negotiation and day-to-day
tactical procedures on collective level, and the strategic alliances made with external actors at the level of institutions and intermediaries.

Table 2: Research foundations

<table>
<thead>
<tr>
<th>Ontology</th>
<th>Relational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epistemology</td>
<td>Socio-material understanding of knowledge-making</td>
</tr>
<tr>
<td>Theoretical approach</td>
<td>Sustainable consumption, practice theories, participatory design, and science and technology studies</td>
</tr>
<tr>
<td>Conceptual frameworks</td>
<td>Self-production (e.g., Do-it-yourself)</td>
</tr>
<tr>
<td></td>
<td>Collective speculation (e.g., experimentation and utopia)</td>
</tr>
<tr>
<td></td>
<td>Extended design authorship and timeline</td>
</tr>
<tr>
<td></td>
<td>(e.g., infrastructuring and workarounds)</td>
</tr>
<tr>
<td></td>
<td>Materially mediated participation (e.g., material publics)</td>
</tr>
<tr>
<td></td>
<td>Negotiation of legitimacy (e.g., strategy and tactic)</td>
</tr>
<tr>
<td>Methodology</td>
<td>Multi-sited ethnography</td>
</tr>
<tr>
<td>Method</td>
<td>Participant observation and semi-structured interviews</td>
</tr>
</tbody>
</table>

Finally, the audience who will benefit from my research are PD and STS researchers interested in taking inspiration from existing material engagements of citizen collectives to reformulate collective design engagements in the public realm; people researching sustainable consumption focused on public infrastructure and emerging subjectivities around a ‘make, test, and repair’ culture; and actors practically engaged with the legitimisation of such a culture, including those participating in and organising DIY spaces, institutional entities, and policy-makers.

1.3. The structure of the dissertation

The dissertation comprises the four research papers and this framing introductory essay, with six chapters. In the second chapter, I describe the context for the research, which is situated at the intersection of PD and STS scholarship. To a lesser extent, I draw from contributions in sociology
of consumption and environmental politics. That chapter begins with an overview of how people have consumed and produced in a self-directed manner and of how that is interwoven with notions of expertise. After this, I highlight a secondary function of collective DIY activities as a materially mediated modality of acting out ideals and building infrastructure. This part also addresses potential hindrances to the long-term continuation of collectives. Consequently, the second part of the literature review employs a PD- and STS-inspired perspective to examine the ongoing work devoted to socio-material collectives’ endurance. In the final section of Chapter 2, I focus on how sites for collective DIY engage with established actors at both strategic and tactical level to negotiate their broader societal relevance. Chapter 3 outlines the four years of research conducted. After articulating the philosophical assumptions and theoretical approaches that formed the foundations for my enquiry, I discuss the process of gathering data sets across several sites and how I made sense of the respective data sets, via different levels of observation. The summary of the research papers, written in 2017 to 2020, form Chapter 4. The next chapter of the framing essay presents the cross-cutting contributions to answer the research questions, followed by the implication of my research in the sixth and final chapter.
2. The making and repair of objects and collectives

This chapter lays out the context for the research and introduces important terminology used by researchers and practitioners in the relevant fields, namely PD, STS, and environmental politics. The first part of the discussion examines how communities engage with ‘stuff’ to actualise different ideas of consumption, production, and collective organising in the everyday. In the second part, I consider the sustainment of such collective efforts from a design perspective and underscore how claims of relevance and expertise are constitutive to this undertaking. The following table presents an explicit outline of how the four subsections of this chapter discuss the research gaps identified.

*Table 3: Relations between research gaps and portions of the discussion*

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Research gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.1</td>
<td>1: Differing conceptions of DIY</td>
</tr>
<tr>
<td>‘Blurring of boundaries: DIY bridging between expert and amateur, design and repair’</td>
<td>Sociology of consumption, design studies, and science and technology studies addressing overlaps of DIY, design, and repair and examining the making of expertise</td>
</tr>
</tbody>
</table>
2.1. Engagement with the everyday through material means

Besides paid labour, humans engage in varied productive work in their private, day-to-day life. This work can be approached via such concepts as self-sustenance, craft consumption, and DIY. I begin the discussion by introducing some of these different yet overlapping concepts, and then shift the focus to expertise and how experience and relevant audiences matter for it. Subsection 2.1.2 examines the why, what, how and where of such collective forms of DIY, making use of political theory on collective protests and, especially, the ‘material turn’ in the social sciences.

2.1.2 2: The politics of organising collective material engagement

‘New Materialism: The politics of collective material engagement for the everyday

Science and technology studies, social-movement studies, and urban-geography research on how, where, and against which orders collective material-based learning takes place.

2.2.1 3: The day-to-day creative work to sustain initiatives and enable material engagement

‘Infrastructuring: Collectives’ socio-material endurance over time’

Participatory design work and science and technology studies dealing with mundane and invisible work in extended collaborative settings.

2.2.2 4: DIY spaces negotiating expertise with institutional actors

‘Relevance: How collectives and institutions negotiate expertise’

Work in science and technology studies on expertise, experiments, and demonstrations; sociology of consumption and urban-geography scholarship on strategy and tactics.
Examining various key concepts related to DIY, such as making, crafts, design, and repair, enables understanding how the notion of DIY blurs commonly accepted distinctions such as the amateur/expert dichotomy. Once I have considered these distinctions below, I turn to a better way of conceiving of collective forms of DIY in the public realm: in terms of experiments. This aids in understanding the negotiation of expertise by means of demonstrations and audiences.

To make do with what is at hand, and to appropriate this approach as a means to an end, is an age-old pursuit: DIY is neither a new phenomenon nor reserved to the West, as a range of terms that includes the Brazilian ‘Gambiarra’ highlights (Fonseca 2015). Still, most of today’s academic research places the beginnings of DIY proper in the early twentieth century, when this activity was often driven by necessity (cf. Atkinson 2006). In contrast, the latter half of the century saw the rise of consumer society, and the meaning accorded to ‘DIY’ in many contexts changed accordingly from necessity to leisure practice (cf. Gelber 1997). Various convenient kits followed, in line with the deskilling of wage labour. Today, the versatility of DIY’s meaning persists, and it draws together needs for resourcefulness, leisure time, and self-development (Jalas 2006; Atkinson 2006). Likewise, most studies stress that many members take part not only for the sake of individual-level learning but also to share their knowledge with the community or to get inspired (cf. Kuznetsov and Paulos 2010). While notions such as Do-It-Together (DIT) and Do-It-With-Others (DIWO) (Furtherfield 2012) have been articulated on this basis, I confine myself largely to the terms ‘collective DIY’ and ‘DIY spaces’ here (I will discuss the choice of the latter term and the definition in Section 5.3).

The notion of DIY overlaps with several other popular notions of material, skilful engagement including making, craft, design, and repair. In Anglo-Saxon-influenced countries, the first of these, making, is often conceptualised as fabrication through digital technology. It has recently received increased attention from the public, academics, and even policy-makers in connection with bold promises of open and local production
The making and repair of objects and collectives (Kohtala 2016). However, Turner, in his analysis of the narratives at play in the so-called Maker Movement, emphasises the Puritan traditions of self-discovery, diligence, and salvation, thus taking issue with the idea that individual creativity alone could overcome structural economic shortcomings (2018). Boeva (2018) points out that narratives around making often reproduce gendered values and exclude less technologically mediated practices, such as mending and similar domestic reproduction activities. The consequence is less open and inclusive environments than envisioned, but awareness of this has driven researchers and practitioners alike to create spaces that demonstrate more inclusive alternatives (cf. Rosner 2014; Foster 2017).

The term ‘crafts’ affords a less technology-focused description, and draws from well-established and respected traditions (Bean and Rosner 2014). While the word today stands for a specific way of producing things, the guild structure of mediaeval times points to origin in politics of collective power and preserving expertise (Sennett 2008). In comparison to crafts’ interplay of human hands, tools, and material throughout the production process, the word ‘design’ has frequently been reserved for planning, divorced from executing (Pye 1968). Nonetheless, Walker (1994) argues that design covers certain aspects of what we regard as craft, such as an appreciation for material qualities and the manual-mental work involved.

The final above-mentioned notion inextricably linked with DIY is that of repair. Repair and consumption usually take a background role due to society’s preoccupation with production and novelty, as several authors have recently highlighted (Graham and Thrift 2007; Russell and Vinsel 2016; Strebel et al. 2019). That said, their research contributions have helped shift our attention to the work of maintaining the socio-material environment we depend on – be it mobility, waste-disposal infrastructure, or simply the social relations at the heart of the infrastructure – and the workers engaged in it. To maintain something entails a form of care, of attention directed at some things or people we take for granted (cf. Mattern 2018). In this regard, also ethnographic research into collective repair and maker sites (Rosner and Ames 2014; Toombs et al. 2014) as well as workplaces (Henke 2000) has foregrounded the connections between repair of physical objects and of social relations. Further, such everyday acts of repair are not necessarily restricted to mere restoration (Jackson 2014; Maestri and Wakkary 2011);
often, they are highly creative workarounds (Alter 2014; Botero 2013), in themselves thus manifesting a close relationship to the trial-and-error element of DIY. However, repair remains different from DIY insofar as it has a clear link to circulation of resources. Especially with regard to the intensifying circular-economy debate, it should prove interesting to see whether repair continues its life in the shadow or steps into the limelight. Finally, aligning with Boeva’s (2018) point about gendered narratives of making, a repair-oriented perspective to DIY offers a chance to view DIY as an ethos neither of feminine reproduction nor of masculine production.

With the terminology thus teased apart, I will now address how to demarcate DIY. The most obvious boundaries for distinguishing it from phenomena with similar definitions relate to sets of aesthetic regimes and hence bring questions of legitimacy and democracy (Atkinson 2006). Indeed, several authors have underscored how DIY has supported democratising everyday life; creating accessibility of leisure practices previously reserved to the upper classes (e.g., by virtue of building one’s own boat or gaining access to modernist design principles); and reinforcing gender roles while also breaking their bounds, by realigning masculinity with domesticity in the post-war era (cf. Jackson 2010). To extend this line of thought: DIY can equally well challenge professional expertise. Technological advancements, affordable equipment, and knowledge-distribution channels have rendered amateurs’ participation possible in numerous fields that were formerly exclusive to experts, from painting and plumbing (Atkinson 2006) to, more recently, biology (Meyer 2013) and sustainable energy innovations (Hyysalo et al. 2013). This highlights that DIY work calls into question not only our understanding of expertise in design but also, in general, our sense of who may legitimately produce technology and therefore also partake in societal processes of change.

Before I embark on a broader discussion of the making of expertise, I provide a summary of the growing body of literature on user contributions to design. Several STS scholars have added nuanced understanding of the spectrum of consumption and production. Among them is Eglash (2004), who speaks of ‘reinterpretation, adaptation, [and] reinvention’. Also, there have been consumption-focused sociological efforts to shed light on forms of active use – most notably, Campbell (2005) differentiated among ‘cultural dupe, personalization, customization, [and] craft
consumption. In design research, one of the continua suggested is ‘adapter, maker, explorer, creator’ (Hermans 2015). To integrate these concepts, which are of a domain-specific nature, Kohtala et al. (2020) developed an inclusive framework whereby the categories uses, objects, meanings, and local settings are mapped along a continuum of skilfulness that includes ‘use as-is’, ‘active use’, ‘user design’, and ‘user innovation’. Then, in accordance with the increasingly collective aspect of DIY and user engagement, the framework was extended to encompass further categories: communities, imaginaries, and global platforms.

With reference to the latter framework, I will highlight a selection of examples that serves to illustrate the range described above: Firstly, active use can describe the repair of garments, while user designs in the ‘object’ category could involve ‘altered objects’, and in the empirics of my research I encountered a type of cargo bike produced with an atypical construction material, aluminium, which allows the product to be lightweight and makes it easier to assemble. Regarding user innovation, an informant speculated about a new-to-the-world hybrid bicycle-pump station equipped with sensors that could detect fires nearby or urban drought. User innovation at community level could include new ‘governance models for meetings’, for reconsidering when to meet and who has which responsibilities. Finally, at global platform level, user innovation could cover new online platforms or umbrella organisations such as the OW A, which acts as an intermediary for open workshops across Germany.

While such frameworks can help us to see the nuances of skilful engagement, how one becomes skilful needs further explanation. In fact, several authors have taken issue with the notion of skill itself. Most notably, Pye (1968), in his now classic book *The Nature and Art of Workmanship*, states that skill differs in meaning depending on the kind of work so does not serve as a useful lens. He recommended using the term ‘workmanship’ instead, i.e. ‘the application of technique to making, by the exercise of care, judgment and dexterity’ (p. 22). Closely related to this usage is Sennett’s (2008) discussion of the notion of craftsmanship, which highlights requirements for curiosity and co-operation. Unlike later developments in the labour world, craftsmanship combines problem-finding with problem-solving in a single tactile process. Finally, in the sociology of work, Vallas (1990) has pointed out that concepts such as upskilling and deskilling hide the
complex process behind becoming good at something, which involves both experience-based, embodied knowledge and the social construction of skilfulness.

The first of these, embodied knowledge, is a point of confluence for studies of practices, which describe routinised ways of doing things through a combination of skills, materials, and meaning (cf. Shove et al. 2012). ‘Embodied’ highlights routinisation of knowledge through the body in ways that cannot be expressed verbally; e.g., a craftsman or craftswoman knows how much force to apply but can only partially convey this feeling to a novice (cf. Polanyi 1983, Gherardi 2009). In this regard, design researchers have discussed experience as crucial for progressing from novice to expert if one wishes to avoid a constant trial-and-error approach and develop a feeling for what works (Cross 2004). That said, as I will argue further on, being an expert and relying somewhat on trial and error are not mutually exclusive, especially when blurry problem constellations present themselves, as visible amid socio-ecological transformations.

The second perspective that Vallas points out – namely, that of skilfulness as socially constructed – becomes especially compelling when one analyses DIY not as a private form of material engagement but as organised collective action in opposition to commercial practice (Hyysalo et al. 2013). Expertise, after all, consists in the way external entities deem the given knowledge relevant and in how that knowledge can be demonstrated. As Merrifield (2017) puts it, amateurs are those whose possible excelling at doing something specific is ‘unimportant’ for it is done in their leisure time. In contrast, professionals are those we actually listen to, merely because they apply knowledge in ‘important’ ways. Defined in more precise terms, ‘[e]xpertise is always about something that is relevant for an audience: the courts, policy makers, decision makers more generally’ (Rip 2003, p. 420). I will further explore the question of relevance in Section 2.2, but in the meantime it can be stated that the context of the expertise in DIY spaces is at least twofold: citing Jasanoff (2003), Boeva (2018) discusses maker expertise as constituted within a community of those interested in making and repairing while, on another level, it is then constituted by virtue of how such initiatives are invited to participate in the fabric of urban life, be this through public events, conferences, or city-administration projects. This fabric entails mature networks as much as cultivating new relations
In this respect, the rise of DIY expertise begs for analysis from a spatial and material perspective – namely, where does collective DIY take place, and how does knowledge and, accordingly, expertise get created, negotiated, and shared by material means? Here, STS perspectives on experiments and demonstrations serve useful. In their classic book *Leviathan and the Air-Pump*, Shapin and Schaffer (1985) emphasise the complex interaction among humans, non-humans, and tools in experiments, that renders the process difficult to replicate – where replication is an essential step for the production of evidence in the natural sciences. Demonstration of expertise, the public display constituted by demonstrators and witnesses, is equally important in the making of scientific legitimacy (Barry 1999; Laurent 2011). However, because the boundaries between the experiment and society are, again, permeable and far from absolute (Latour 1983), partially controlled experiments referred to as ‘living labs’ or ‘real-life laboratories’ are increasingly viewed as the standard modality of applied research in areas such as sustainable consumption (Evans and Karvonen 2014; Hildén et al. 2017). Some experiments even take place in homes (Marres 2009) or, with regard to collective DIY, feature observations in ‘shared machine shops’ (Dickel et al. 2014) where citizens explore new forms of collaboration and inclusion.

These examples underscore that ‘experimental’ need not refer to purified or at least partially controlled science alone; equally, the paradigm can be found throughout modern life, for a type of learning that occurs when individuals or collectives break with given routines in an open-ended manner (Gross and Krohn 2005). With regard to material engagement, I argue that DIY practices confer experiences that challenge subjects to understand material possibilities and limitations. This aligns well with the foundations of Dewey’s educational research. His attention to learning through experiencing real-world problem settings as compared to mere passive reception of predefined knowledge appeared ground-breaking at the time (2004 [1916]; 2013 [1938]). He also suggested that a break with routine, what we might call a moment of surprise, is fundamental to learning (1988 [1922]), and, in the contexts of an experiment, I argue, such a moment requires witnesses.

The foregoing discussion of the constellation of meanings attached to
DIY and the wide continuum of expertise connected with material engagement points to dependence on experience but equally on the benevolence of external, legitimate actors. These actors and the associated interaction are crucial for the endeavour. Therefore, I next analyse the politics of organising collective DIY and how they explore practices that differ greatly from what is usually sanctioned in today’s officialdom.

### 2.1.2. New Materialism: The politics of collective material engagement

Various collective forms of DIY have recently gained recognition, with the common denominator of a politicised notion of consumption. Below, I examine three aspects of engagement with them: their temporality as forms of future-making in the here and now; their modality as an ongoing trial; and their location, which requires spaces of opportunity in the built environment.

The last decade has brought renewed interest in collectively organising material flows to satisfy human needs locally (Hielscher and Smith 2014; Bialski et al. 2015) and, consequently, in regarding DIY as a component of an informed and engaged citizenry (Ratto and Boler 2014). In line with this phenomenon, collective forms of DIY and material engagement are proliferating (Seyfang 2009), whether with established formats such as bike kitchens (Bradley 2018), energy communities (Hargreaves et al. 2013), and community gardens (McClintock 2014) or in newer forms such as sewing cafés (Hirscher and Mazé 2019), repair cafés (Deflorian 2020), and the ‘dumpster divers’ and ‘food rescuers’ of the ‘foodsharing network’ (Morrow 2019; Yang et al. 2019). Such communities are commonly differentiated in geographical terms, but, as Anderson (1991) pointed out and online communities empirically demonstrate, more than a spatial boundary a community needs a shared imaginary. While we can further define a community along lines of age, race, gender, sexuality, abilities, ethnicity, or shared interests, these are relatively heterogeneous in the case of DIY communities. Many authors have highlighted that these local communities can satisfy everyday needs such as provision of food, clothing, and mobility (cf. Baier et al. 2016; Schlosberg and Coles 2016; Beveridge and Koch
In light of the previous chapter’s literature review, I posit that they can satisfy needs beyond subsistence too: ‘affection, participation, understanding, idleness, creation, identity and freedom’ (Max-Neef et al. 1991).

Some of these collective, material engagements have, further, been conceptualised as social and environmental movements; in terms of localist agendas for countering global production hegemony (Hess 2016); as environmental-justice actors (Agyeman et al. 2016); or for their display of anti-consumerist lifestyles (Haenfler et al. 2012). Social movements are organised displays or protests by ordinary people taking aim at institutional structures and those who hold power (Tilly and Wood 2013) and arguably differ from communities in their geographical dispersion while their claims unite them (proceeding from the empirics of my research, I therefore refer to communities rather than movements). After the first wave of social movements, which focused on the material aspects of livelihood, a second wave of ‘new social movements’ pursuing equal human rights emerged (Inglehart 1997). Thus, proponents of ‘post-materialism’ argued that human-development needs are of a higher order than basic material needs (ibid.). However, this dichotomy-ridden perspective ignores the diverse examples of collectives in the Global South that fight to satisfy basic needs while at the same time and by the same means also advocating environmentalism or collective autonomy (Escobar 2018) (for P1, I took inspiration from Escobar’s notion of a collective form of autonomy as opposed to the individual form that is more common in the Global North, but I do not use autonomy as a conceptual lens beyond this).

It is precisely in this regard that Schlosberg and Coles (2016) argued that materiality is a common denominator of current self-production movements and grassroots communities in the Global North, ascribing the terms ‘new materialism’ and ‘sustainable materialism’ to them. Indeed, all examples listed in the very first paragraph and in Table 1 are characterised by collective experimenting with material flows and by circulation of practices and knowledge that differs from what is conventionally sanctioned. These are cases of building alternative infrastructure to satisfy subsistence needs just as much as needs to connect with fellow humans and the non-human environment, but the way they act upon the world is through forms of material engagement. Other scholars have recently formulated similar integrative concepts, such as the Material Activist Community (MAC), highlighting...
the collective aspect of imagining (Berglund and Kohtala 2021), or Collective Alternative Everyday Practices (CAEPs), focusing on a grounding in everyday practices (Deflorian 2020). Still others have summarised the dedicated spaces of such collective DIY as ‘Open Workshops’ and ordered them regarding their position between commons- and market-oriented and between technological and social innovation (Simons et al. 2016). Finally, McCrory et al. (2020), examined sustainability-oriented labs by considering their organisation, process and space. I have taken inspiration from the various approaches to conceptualising collective DIY by exploring what these collectives do, how they are organised, and where their operations take place. Before discussing these aspects however, I will first return to the role of materiaility and objects in collective DIY.

The focus on materiality and forms of low-key technology is then constitutive to the collective political project rather than, as is often suggested, a limitation of engagement. Attending to it requires a nuanced perspective on materiality as mediator, of the sort advanced by a plethora of fields, among them STS, environmental politics, and cultural and organisation studies, in connection with the material turn of recent decades (cf. Marres 2012). Objects are increasingly taken seriously for how they can affect people; for example, in the repair domain, a broken art piece possesses potential agency to move you to repair it (Bennett 2014). In the context of ‘new materialist communities’, produced/repaired/consumed objects are then ways to affect people and bodies in their day-to-day life, ways fundamentally different from what traditional social-movement tactics can deliver.

In more precise terms, artefacts, which per the Collins Dictionary are skilfully human-made objects, and tools, meaning artifacts that can be used for further acting upon our environment, are mediators by which humans pursue specific goals. This by no means must result in forms of ‘dull consumption’; it can equally lead to greater engagement with our surroundings (Verbeek 2005). Most notably, actor-network theory (ANT) has been influential in disseminating the idea that humans and non-humans ought to be examined symmetrically – i.e., they form alliances to reach ends and thus should be seen as mutually constitutive (e.g., a bulky hotel key reminds the visitor to leave it at Reception; see Latour 1992). The main contribution of ANT lay in not taking the form of ‘the social’ for granted but studying how heterogeneous elements, be they physical, economic, or semiotic, form
associations such as a corporation or a nation-state (Fox and Alldred 2017, p. 16). In the case of collective DIY, objects can both actualise and display parts of the future for which such collectives strive, yet they simultaneously also underscore how they matter to humans.

It is important to remember, however, that these very objects can be politically charged with different meanings, an observation that led Marres (2012) to speak of ‘multivalency’. Nold (2017) followed up on this notion through the example of a citizen-led project that used self-produced devices to measure the air quality around London Heathrow. Some people engaged only to show their concern for air quality, while others were interested in the technical aspects of creating citizens’ science infrastructure. In this light, I argue that multivalency may be visible in the DIY spaces themselves, on account of how they combine leisure, social, and educational settings and address a mixture of topics, including food, fashion, and handicrafts, thereby mobilising citizens of many stripes, with a wide spectrum of values.

Mobilising citizens via creation of practical alternatives brings further political aspects to the fore – on a temporal level through a form of future-making in the here and now and, secondly, on the modal level of how to do so in a collective. With regard to the former, the term ‘prefiguring’ emphasises how (especially in left-leaning insurgent collectives) ideas of a better world are acted out and, thereby, the means to an end – such as decision-making modalities or social interactions – reflect the end itself (cf. Yates 2015). Inherent to such a collective is that the experimental process is a form of utopian practice. Indeed, various scholars interested in the notion of utopia have portrayed utopias as process-led enquiry rather than a fixed end state the pursuit of which would risk eventual dystopia (Mannheim 2015 [1929]). As Sargisson (2007) argues, it is the nature of utopian endeavours to connect what is in the making with existing narratives and practices. From this perspective, new material practices are not completely different from what is conventionally accepted; rather, they are expressed as repair to existing arrangements.

I argue, therefore, that collective forms of DIY engage in a constant trial of materialising futures in the here and now, by means of connecting to people’s everyday life. Indeed, envisioning different futures is evident in many forms of material engagement, and even professional design has been argued to be inherently utopian (Dorrestijn and Verbeek 2013). As part of
this, speculative design (Auger 2013) demonstrates how design can engage in visualising or problematising varied conceptions of the future. While such design is much needed, I see it as a temporary and artificial set-up in which participants are enrolled for a pre-structured project (cf. Broms et al. 2017), whereas the actors working with DIY spaces negotiate on the basis of their everyday lived experiences. Hence, how they do so matters and should be examined and, accordingly, be valued at least as much as the above-mentioned design interventions.

Secondly, on modal level, a collective process to ascertain what is important and how to concretise this inevitably brings forth tensions due to the multiplicity of goals inherent to a community and the capacities of its various members. After all, as Yates argues, prefigurative politics, which has its roots in anarchist tradition, requires not only acting out, experimenting with, and producing political meanings but, equally importantly, also ‘their consolidation in movement infrastructure, and the diffusion and contamination of ideas, messages and goals to wider networks and constituencies’ (2015 p.1). How groups devise meeting routines, decision-making tools, and definitions of roles or responsibilities and align them with existing resources demands ongoing trial and error and, thus, is part of the everyday practices needed for a process-led utopia (ibid.). In this regard, community associations and researchers with various backgrounds have highlighted the importance of such everyday aspects of collective organising as care work (Morrow 2019), the fluidity of roles and responsibility (Diani and McAdam 2003), and agreeing on decision-making tools and processes (cf. Cabraal and Basterfield 2019).

That said, openness to new input for testing of possible futures arguably runs counter to consolidating as a community. The ensuing balancing act could benefit from research on differing participation intensities in, for example, online communities (Nielsen 2006) or, indeed, DIY communities (Meyer 2013). In our era of highly flexible subjects, socialised to an ever-wider array of consumption opportunities and time constraints, it is unlikely to expect all participants to engage equally. Therefore, in his report on his study of repair and swap events, Deflorian (2020) suggests speaking of ‘refiguration’ instead of ‘prefiguration’, to describe how people are trying to demonstrate an idealised self but are unable to do so constantly. Their utopian strivings are not meaningless or apolitical, but certainly are of a
different quality than the steady engagement of, for instance, members of eco-communes and point to one feature of DIY spaces. While events held by many hobby and political groups represent infrastructure that is essential for reaching out to people or even for the group’s very existence, combining event-based modalities with more stable, local infrastructure highlights a potential strength in the ‘new materialist’ framework.

Besides temporality and modality, there is a third level at which it is useful to understand where in the built environment people can find affordable space to build collective alternatives. Principally, DIY spaces and similar alternative entities may need what transition studies describe as protected niches, in which novel socio-economic practices can become robust enough to inspire processes of socio-technical change (Coenen et al. 2012; Longhurst 2015). Informed by my project’s grounding in materially mediated practices, I argue that only through practising differently – and I might add, collectively – can things change. Hence, I use the concept of tactics offered by De Certeau (1984), who portrayed urban space as full of potential, leaving room to manoeuvre and be used differently than officially planned. This thinking adopts Lefebvre’s (1991) perspective: while the ‘proper’ use of urban space is ordered by the authorities, it is never complete – ‘beneath the road, the beach!’ is his utopian but simple reminder that there might be another way. However, this must coalesce: unless the modality of coming together and engaging in DIY is an event – such as a repair café – it is crucial for DIY initiatives to find affordable physical space. This grows all the more difficult with the gentrification of former industrial wastelands and when temporary-use models remain ‘filler’ in the urban landscape (Tonkiss 2014; Berglund 2016).

The problem of affordable space underlines an overarching challenge for DIY initiatives: the narrow path between being allowed to act out ideals through alternative socio-economic practices from within the existing capitalist system and the risk of these attempts ending up co-opted (Pepper 2005). Also subject to critical discussion in this regard are the changing roles of the individuals involved and of activism itself. Indeed, a few invested citizens stand out as pragmatic strategists who regard trustful relations with local institutions as essential to their activism (Chatterton and Pickerill 2010). Hence, some researchers argue that citizens and institutions should co-produce relevant knowledge so as to bridge the gap between production
of knowledge and its application (May and Perry 2017), while others take issue with this approach. In critical urban geography, most notably Mayer (2003; 2013) identifies a ‘middle class activism’ and its usefulness for a neoliberal ordering of space, whereby ephemeral repairs are produced and pseudo-participation leaves the prevailing narratives largely untouched, yet at the same time she does show that some activists build bridges with those citizens left at the margins.

Aware of these dynamics, McClintock (2014) draws attention to community gardens as sites of both the neoliberal order’s maintenance and a radical counter-movement, arguing that they can function against markets’ excesses even while – knowingly or unknowingly – reproducing neoliberal ideas. Such a positioning is further supported by the breadth of relations a community garden may have with city officials, of their varied operation logics, and of the effects on participation (Bródy and de Wilde 2020). Among the phenomena are ‘responsibilisation’ of citizens, whereby social divides are intensified through membership fees but also the creation of fairly autonomous community spaces. Identifying similar factors, a study of ‘austerity urbanism’ and the creation of a ‘pocket park’ in Bristol pointed to a need for such a nuanced perspective on co-option (Sara et al. 2020). While clearly perpetuating neoliberal logics of doing more with less, the project also turned privatised land into a public space driven by community spirit. Amid such tensions, it is vital that we understand the situatedness of specific citizen initiatives and how they can negotiate their collective future before we label them as examples of either activism or co-option.

For the foregoing discussion, I took as a starting point the ways in which DIY culture blurs the lines between design and repair, production and consumption, and expert and amateur. This perspective enables highlighting how DIY practices are inherently a form of materially mediated learning and enquiry into our environment, albeit limited in its effect unless it can be demonstrated with and in front of others. In the second part of the discussion, I examined collective forms of DIY and their function as infrastructure to circulate materials but also alternative practices of being and relating to our surroundings according to the questions why, what, how and where. Many of these practices are different from what is conventionally sanctioned, yet they are (and, I would argue, must be) anchored in everyday routines to which we can relate. The discussion highlights
that considerable potential remains for shortcomings of collective DIY as infrastructure. These risks lurk in the transience of participation, following from the constant ‘flexibilisation’ of late-modern subjects; in the unavailability of affordable space; and in co-opting by the dominant paradigms.

2.2. Consolidation and reworking of collectives

As clarified in the previous section, DIY practices are shaped in increasing proportions through collective organising. However, there are implications for the entities' long-term existence and broader societal relevance and for the discussion below, I take a PD perspective to address these. After examining, from a design angle, the endurance of collectives despite changing cohorts over time, I devote the second subsection to a more nuanced understanding of the negotiation of relevance between initiatives for collective DIY and institutional structures.

2.2.1. Infrastructuring: Collectives’ socio-material endurance over time

Recent developments in the field of design research provide a useful lens, especially with regard to its extended area of application and adoption of a relational perspective on it – i.e., awareness of how a design is useful in different ways to different people. After outlining these developments, I introduce PD engagements with communities, such as neighbourhoods and minority groups, then explicate particular concepts, namely infrastructuring and workarounds, that support a better understanding of the who and how of participation in such processes.

In his book *Making Design Theory*, Redström maintains that, while design takes shape today in a variety of professions and hence follows from several distinct traditions, a set of common challenges unites these endeavours (2017). He lists them as performance challenges, related to such issues as satisfaction of needs and shaping of our built environment; substantive challenges, such as blurred artefact/process boundaries or ambiguous re-
lations between needs and constraints; and contextual challenges, among them projects wherein multiple stakeholders and, thereby, disparate expectations intersect. Overall, what his evaluation underscores is traditional design education's lack of capacities for understanding the complexity of human interactions and the organising of our built environment. Earlier contributions addressing this complex and extended field of design have highlighted those largely invisible aspects of design, which shape our environments but are not accounted for as design (Burckhardt 2012 [1980]). I find Burckhardt's perspective particularly timely today in shifting the focus from well-defined settings such as a household or workplace to relations among the things, people, and institutions that make up the setting. There is value in his conclusion that designs are ongoing developments through interaction in use.

Following these perspectives, I explored the relations made and rearranged in communities such as DIY initiatives' and which/whose work can consequently be accounted for as a form of design. More specifically, in line with recent engagement of design research with settings that feature communities and the public space (Bieling et al. 2010; Björgvins-son et al. 2010; DiSalvo et al. 2013), the aim of this research was to gain understanding of contemporary forms of non-professional design in the everyday, also referred to as silent design (Gorb and Dumas 1987), and, through this, inform participatory design practice. In his critique of everyday life, Lefebvre (2008) posits that everyday forms are not 'prelogic' but something with an underlying order that is relevant to those involved and can be uncovered; however, the practices forming the pillars of this order continuously evolve (Shove et al. 2012), especially in the face of constraints (Eglash 2004), so constant appropriation of these practices and alignment of them with people and technologies is necessary (Botero and Hyysalo 2013). Therefore, in considering design with and by communities in the everyday, we must extend not only the scope of authorship but, equally, that of time (Ehn 2008; Redström 2008). In this regard, Botero (2013) stresses two concepts derived from STS work that have been influential in the last decade within PD. Below, I examine both of these – thing design and infrastructuring – further.

Thing design, which expands the design scope beyond objects alone, can be traced back to Latour’s concept of Dingpolitik (Latour and Weibel
The making and repair of objects and collectives (Ehn 2005), which makes use of a historic Nordic term for governance assemblies. Accordingly, how socio-material assemblies negotiate and deal with controversies or matters of public concern are at the centre of thing design (Ehn 2008). This perspective serves activities in, for instance, grassroots settings for alternative, collective production of everyday goods, public services, or spaces – in short, those collectives aiming to counter expert-oriented innovation through democratic negotiation on the issues. I explore the forms of this negotiation further in the final portion of the discussion, in Subsection 2.2.2.

Infrastructuring, in turn, highlights the alignment of artefacts, users, and practices with the changing context. This sets it apart from most other design approaches, which emphasise specific artefacts and thereby often neglect the context in which these are embedded (Pipek and Wulf 2009). In participatory design endeavours, infrastructuring is often applied to pursuit of a flexible design approach that has an open time horizon and in which adaptation to and appropriation of emerging needs and opportunities matter most (Karasti 2014).

Before delving more deeply into the use of infrastructuring in PD, I will discuss its root through the notion of infrastructure: Infrastructure is commonly understood as a network in which goods, people, or ideas can circulate (Larkin 2013) but also as technical structure or even the collection of artefacts and users that is crucial for the practice or organisation in question (Lee and Schmidt 2018). Further, it affords an approach through which societies can be technologically organised, removed from obvious political institutions, and thereby mobilised for producing both specific relations, between citizens and the state, and symbolic meanings such as technological progress (Barry 2001; Schlosberg and Coles 2016). Infrastructure is matter but also a web through which matter can flow, yet our typical approach, accentuating the circulation of the matter itself, can push the actual infrastructure further into the background (Larkin 2013). Many authors have gone so far as to endorse Star’s (1999) argument that infrastructure cannot become visible until it breaks down, but others consider it more useful to attend to degrees or stages of visibility (Larkin 2013) or to how particular sorts of infrastructure enter and leave fashion (Moss 2016). Clearly, it is important to ask what and when something becomes appreciated as infrastructure (Star and Ruhleder 1994). While
there are many ways of discussing infrastructure, a tendency persists to regard these as large socio-technical systems that evolve rather than being fixed environments.

The notion of infrastructuring, then, has gained traction in PD for its focus on the relational and processual nature of creating infrastructure that connects diverse actors, practices, and technologies (Karasti 2014). Here, ‘relational’ denotes something that is not an essential capacity but a product of how people and objects relate to each other. Infrastructuring considers possible overlaps between people, practices, technologies, and even ideologies and how these might affect participation and designing (Agid 2016). With this concept, one must consider more than the ways in which existing infrastructure enables or limits use; equally, it is oriented to forms of and opportunities for future use. Consequently, several authors have argued that infrastructuring has to rely on designing incompleteness if future use cases are to emerge (Allen et al. 2000). To this end, PD’s use of ‘design after design’ to describe how laypersons continue a project after the facilitating designers have departed (Redström 2008) and of ‘design in use’ for how users appropriate designs (Henderson and Kyng 1991; Ehn 2008) function as additional lenses for specifying how designs may be open for continued development.

Despite the connotation of infrastructure as large-scale, Karasti and Syrjänen (2004) posit that infrastructuring suits local communities, on grounds of how their members and the capacities they bring forth are embedded in larger systems over longer time spans. DiSalvo et al. (2013) are among those who emphasise that infrastructuring can contribute especially to PD research into communities’ endurance through building of relations between different kinds of actors. Several studies have directed attention to matchmaking of this sort, in such contexts as a minority community in Sweden (Hillgren et al. 2011) and an association for homeless people in the US (Le Dantec 2016). In both cases, the work focused on aligning needs and capacities with emerging opportunities, which, in turn, created new, thus-far unconsidered possibilities to design with. As Seravalli (2018) has emphasised, a purposefully incomplete manner of community organising may offer advantages over traditionally robust organisational systems, which tend to solidify over time and become so inflexible that they cannot react to changing requirements by (new) participants. This
underlines the utility of infrastructuring for apprehending how processes of collective provisioning and self-governance are designed (see Prost et al. 2019 on infrastructuring of food democracy). While this approach supports the work represented by my dissertation, it has not been applied at large on spaces for alternative production and consumption. At the time of writing, I could identify only two notable exceptions, both in the form of dissertations, one on the co-design of a maker space (Seravalli 2014, 2018) and the second on the co-design of a sewing café and the process of hand-over of responsibilities from a design facilitator to the people involved (Hirscher 2020a).

With regard to community settings, the notions of matchmaking and facilitating emphasise how the majority of PD research operationalises infrastructuring: in terms of staged or designer-facilitated processes. This stands in stark contrast to the PD engagements developed in and through the work of organisers and volunteers in existing communities; hence, there is room that demands further understanding (Le Dantec and DiSalvo 2013; Agid 2016). While the dissertation project, by and large, examined examples of design in communities rather than designer-facilitated communities, considering the notion of facilitation still proved illuminating: it brings out another crucial distinction, that between assigned/ascribed normative roles, or what actors ‘should be’ doing, and descriptive roles, or what the actors are actually doing (Redström 2008), when, and by what means (Botero 2013). These questions become especially relevant in connection with DIY initiatives, which are often dependent on paid labour and volunteer work simultaneously, while also exhibiting a strong belief in flat hierarchies. After all, awareness of what they regard as crucial for their practices would help us to understand which resources are useful and how they are created.

For refining the concept of infrastructuring, it is instructive to recognise that most contributions to its discussion are centred on terms such as ‘alignment’, thereby highlighting the shortcomings and repair of existing configurations, especially those that have ossified and limit response to emerging needs. Examples are found in the work of Karasti et al. (2018) and Botero et al. (2019), where infrastructuring is described as an approach that considers all creative workarounds with lasting consequences for the completion of a practice. Workarounds are shortcuts (Pollock 2005), design
activities intended to weave together technologies and collective ways of
doing things, especially when current policies, regulations, or technical
issues prevent them from matching perfectly (Botero 2013). Thus, work-
arounds are repairs of material settings (Alter 2014), and can be an impor-
tant part of design with communities; e.g., existing building codes or
funding mechanisms may require actors such as DIY initiatives to come
up with workarounds.

Better understanding of how such forms of repair unfold in the everyday
requires pinpointing the oftentimes invisible efforts that collectives engage
in prior to design work, such as planning, collection of ideas, or facilita-
tion of discussion (cf. Hyysalo and Hyysalo 2018), or in post-design work
such as documentation of the design processes and learning outcomes. The
practice of documenting in particular is essential to self-organising yet fre-
quently not regarded as a core activity (Botero and Saad-Sulonen 2019).
Of similar importance are the artefacts that communities make use of to
mediate their planning and documentation work. From collaboration with
a social-justice organisation, Agid (2016), identified how vital such simple
designed artefacts as infographics, booklets, and preliminary sketches are
for project partners, in uncovering differences in understandings or val-
ues, and, through this, for shaping their working relationships. Similarly
to such design prototypes (Sanders and Stappers 2014), the tools used to
communicate, organise meetings, or make collective knowledge available
are seemingly mundane yet are vital facets of design work in the everyday
and contribute to maintaining communities. These tools have been referred
to as artefact ecology, to highlight their evolving and relational nature,
and, that the initial negotiation and the founding members’ choice of tools
are crucial factors in how the tools and community co-evolve over time
(Bødker et al. 2016). These examples are testament to how attention to
alignment and repair leads to a much broader and more nuanced under-
standing of who and what is important for the design process.

In this connection, Hillgren et al.’s (2011) report on their project for the
upcycling centre ReTuren, which involved women from a minority group
and city authorities, stresses that the parties’ commitment to the work
stemmed from trust in each other, which was mediated somewhat by the
credibility of a university research team. Further research has identified
the importance of a complement to building trust: articulating distrust,
to enable better reflection on what could be done differently (Clarke et al. 2019). Finally, Agid and Chin (2020 p.75) stress that, in sum, ‘learning what is valuable, to whom and to what end,’ is essential when designing with community actors. While again, the perspectives expressed are those of designers involved with the communities, they are equally valid when the community actors engage in co-production or negotiation for projects without formally trained designers’ involvement.

The above discussion points to useful ways for design researchers to engage with communities, with the concept of infrastructuring and workarounds holding especially strong potential for understanding the creative repair work that goes into community organising. Particularly worthy of investigation are internal efforts toward sustained operations but also the relations built between communities and external actors, as a form of infrastructuring between emerging opportunities and needs. In this light, the final subsection of the chapter highlights more specifically how communities and institutional entities negotiate with reference to relevance.

2.2.2. Relevance: How collectives and institutions negotiate expertise

The Deweyan notion of publics serves as a jumping-off point for the discussion of relevance. Aided by this concept, which emphasises how citizens come together when institutions fail to deliver, I examine the various forms of relations that groups of citizens form with institutions and how these depend on both tactical and strategic actions. Finally, I draw the threads together by considering how citizen groups form relations with one another, thus building local capacities.

The term ‘publics’, frequently employed by PD researchers who work with communities and how their issues form (cf. Le Dantec 2016), was coined by Dewey to describe geographically dispersed citizens who, being affected by a common issue, form a public to intervene once institutions and their habits have faltered (Dewey 2012 [1927]). This notion was operationalised for STS by Marres (2012), whose ‘material publics’ notion underscores the importance of things in mediation of public participation processes. Proceeding from Marres’s idea of material publics and material
participation, Papazu (2016), in her paper on public participation processes in renewable-energy (RE) transitions, highlights that, while RE concerns prompts people to organise as a group and to discuss matters, the end product for participants was greater community collaboration. Participation is not an abstract goal, then, but something achieved in practice. Such a perspective assists with further enquiry into how participation as a process unfolds.

While the STS notion of publics foregrounds the conflictual, antagonistic aspects of negotiating on issues between very different actors, Dewey’s original discussion centred largely on how members of a public become truly politicised subjects and create ways to engage with administrative powers (Dixon 2020; Hildebrand 2008). Dewey stressed that the main problem facing publics is their lack of institutional power in the long run, which forces them to re-engage again and again (Dixon 2020). Though the notion of DIY spaces or DIY collectives suits the phenomenon studied and its locally bounded nature well, both above-mentioned notions of publics are useful. Firstly, under the Deweyan notion, groups such as DIY collectives emerge because they are affected by the inability of institutional powers to deal with key issues (e.g., that of privatised material flows). Furthermore, they can come together without being part of a close-knit community. Finally, the STS notion of publics aids in identifying how and why the DIY products, guidelines, maps, photos, and other outputs produced by communities matter for the collaboration and for articulation of the concerns to a wider audience.

It is the STS, rather than Deweyan, notion of publics that dominates in PD (Dixon 2020), as part of a larger tendency to elevate formation of local issues over engagement with institutions. According to Huybrechts et al. (2017), this attention has led to fuller understanding of micro-scale politics in the negotiation work of ordinary citizens responding to an issue, but the price paid for that understanding is less attention to the bigger picture. Likewise, the participatory culture itself is witnessing a further shift from large-scale mobilisation of neighbourhoods and villages toward mobilisation of individuals or teams as agents in an agile organisation culture, with the consequence that participation is increasingly valued as an end in itself (Kelty 2017).

The same research points to a positive development too: the institutional
aspect of participation appears more flexible today than in earlier times, thereby making it possible to effect change from within an institution (ibid.). Consequently, Huybrechts et al. (2017) concluded that PD, after having left behind its historical roots to engage with institutions, should re-engage with them to spur internal change in them – a process for which they coined the word ‘institutioning’ accordingly. Their approach relies on defining an institution as ‘rules and procedures that are created, communicated, and enforced through channels widely accepted as official’ (Helmke and Levitsky 2004 p.727), a definition followed throughout this dissertation. With the notion of institutioning, the authors asserted that PD projects can stabilise but just as well rework the role played by institutions in society’s transformation, inclusive of how they are pictured or portray themselves in this undertaking (ibid.). Still, as Lodato and DiSalvo (2018) remind us, these encounters are limited by differences in organisational culture and in norms, such as flat vs. strong hierarchies, spontaneous decision-making vs. long-term decision protocols, and procedural vs. open thinking. These tensions often lead to a form of pseudo-innovation consistent with Kelty’s observation of a ‘pseudo-participation’ culture (ibid.).

Citing an example that resonates with the idea of institutioning expressed by Huybrechts et al., PD researchers from Malmö University demonstrated their agency as mediators between citizens and local administrators in connection with the ReTuren project, for citizen-operated recycling (Hillgren et al. 2016; Seravalli et al. 2017). Their studies indicate that the project was terminated prematurely on account of different understandings between the project co-ordinator and the managers within the administration. While the co-ordinator adapted her understanding of the project over time, the managers maintained their institutional paradigm of efficiency. Taking inspiration from the literature on infrastructuring, the researchers posited that breakdowns appear not only between types of operations or contexts but also between worldviews and between divergent values (Star and Ruhleder 1994), pointing to managers’ and citizens’ differing worldviews in this case. Consequently, they asserted that it is crucial to exchange thoughts openly with the other partners on breakdowns that could start to develop between operational and institutional level. With regard to institutioning, the scholars behind the case study have pointed out that, while they lacked legitimacy during their early collaboration with
the city, participatory approaches and concepts such as living labs and infrastructuring form integral parts in new projects in more recent years (Hillgren et al. 2016).

Several PD researchers have devoted in-depth studies to the ways in which communities strive for legitimacy and relevance (see Vlachokyriakos et al. 2018) and for that purpose have drawn on De Certeau’s (1984) notion of strategies and tactics. As introduced in Subsection 2.1.2, strategies refer to the planning and ordering of space and are associated with power, whereas tactics emphasise that which is without power and therefore reliant on opportunities to come to fruition within the ordered space. Lyle et al. (2018) have described the way in which the various actors involved in a research project on bottom-up welfare practices negotiated tactically; they appropriated technological artefacts or contractual documents and angled these to fit the emerging empirical reality of the project, in a manner reminiscent of phenomena observed from the ReTuren project. The authors concluded that these very tactics at some stage evolve into fixed, strategic elements around which to negotiate again.

However strategies and tactics form, Sara et al.’s (2020 p.12) study of austerity urbanism demonstrates the importance of something beyond both tactical everyday actions (such as ‘cooking, site clearing, chatting, drawing, and dreaming to engage amateurs and professionals alongside students and activists’) and strategies (such as securing top-down funding): ‘manoeuvres’ – using one to exploit the other. The study highlights the roles of those who can switch between the two poles – e.g., fighting legal red tape but also handing over some responsibilities to formal entities, to exploit structures. Furthermore, the authors stressed that, though formal systems were important, insofar as they gave permanence to the project, these strategies appeared only after bottom-up tactics had charted the formerly invisible territory.

Integrating the various concepts discussed above, Teli et al.’s (2020) research report on the relations among institutions, designers, and grassroots communities characterises the first two – institutions and designers – as operating together in a strategic space and the latter two – designers and grassroots – in a tactical space. Their analytical framework positions processes of institutioning, co-optation, and intermediation as taking place in the strategic space. On the topic of co-opting, they distinguished
between a more obvious form, similar to what Kelty (2017) presented for fake participation to legitimise predefined goals, and a less obvious form, in which local administration entities embrace neoliberalist principles and focus on market solutions offered by tech start-ups to overcome the problems this very logic has produced. At the same time, grassroots projects attempting to cope with the existing order might already be out there, with their principal need being for achieving visibility and, even more important, getting taken seriously – a process in which designers can function as intermediaries (Stewart and Hyysalo 2008). Finally, employing the term ‘redundancy’, the authors described situations, encountered in my own empirical material too, wherein designers either handed over responsibilities during the project or simply were not present or necessary in the grassroots–institution negotiations.

Whatever negotiation skills they possess, grassroots communities must – as several researchers have pointed out – cultivate a wider base of constituents, since they face existential challenges related to money, volunteers, time, and legitimacy (Seyfang 2009; Smith and Stirling 2017). Especially with regard to the notion of new materialist collectives as geographically dispersed but ideologically coherent groups of people and places, cultivating an alternative view of intermediation is worthwhile. The notion can be extended beyond a purposefully established process for bridging gaps to institutional power. Intermediation can also encompass, in aggregate, how such places and groups become useful to and create alliances with each other to appear to be more legitimate actors. To this end, I find the notion of meshwork (Light and Miskelly 2019) of use for considering how social benefits arise when multiple initiatives – such as a time bank, a micro library, and a workshop – provide mutual support and thus make it more likely for further initiatives to succeed. As Light and Miskelly suggest, any bottom-up relational practice can help support the community and the building of alliances between the actors.

Setting these thoughts in relation to those at the beginning of the chapter, I provide a final summary of my understanding of the phenomenon of DIY collectives. To articulate how this phenomenon challenges several dichotomies (among them expert/amateur and design/repair), I framed it as a form of materially mediated enquiry into our environment, with emphasis on the need for an audience of relevant actors, given that this is
The making and repair of objects and collectives.

a process of making expertise. Following this, I further situated collective forms of DIY in relation to a range of collectives that, being invested in a ‘make, test, and repair’ culture, strive to build alternative infrastructure to shape resource flows. I identified several problematic implications with regard to the endurance of these collectives, including the relations between internal and external actors.

The implications led me to examine PD’s current engagements with non-professional communities, with particular attention to tools for analysing the everyday workarounds that are crucial for sustaining them. My review of the literature directed me toward the notion of infrastructuring as alignment of emerging needs and opportunities, so I explored conceptions of how citizen initiatives negotiate their relevance and legitimacy with regard to external institutional arrangements. While a dichotomy between tactical and strategic approaches remains dominant in PD research and the urban geography literature, various studies do highlight the space between these poles. This blurred arena is host to forms of co-option by institutions, forms of infiltration and reworking of the logics within institutions, and forms of intermediation articulated through building of relations.
3. Methodology

This chapter focuses on both the overall approach to the doctoral research and the methods I have applied. The discussion begins with the philosophical underpinnings and theoretical approaches guiding my enquiry. Then, Section 3.2 situates the data-gathering process more specifically in connection with multi-sited ethnography, with an overview of the sites and the respective data sets. Finally, I address the analysis of my data, with special attention to the importance of multiple levels of observation.

3.1. Research foundations

Philosophical underpinnings are of fundamental importance for the research process. After all, the larger paradigm within which we position a study determines which methods suit the project. Accordingly, I begin the discussion of methods by introducing my overall approach, pragmatism, and then examine the consequences of a relational ontology and an STS-derived socio-material perspective on knowledge-making. These considerations form the basis for the concrete choices of methods.

While pragmatism as a philosophical tradition was influenced by a wide range of thinkers, I have relied mainly on the conceptions of Dewey, for his dedicated research on a practice-based and collective-based form of enquiry aligns well with the general phenomenon my research examined:
Miettinen et al. (2012) characterise Dewey’s central concern as the question of whether legitimated and routine ways of acting could be supplanted or replaced by reflexive, collective enquiry in action. Pragmatists believe, in a contrast against Cartesian thought, that none of our enquiry proceeds from a distanced and neutral position; rather, we must resort to experience as a component of all enquiry. Thus, pragmatists resist a body/mind dichotomy (Lorino 2018).

In similar fashion, pragmatists take issue with another dichotomy: representation/reality; they reject the stance that our conceptions of the observed world could represent a completely determined reality, and they maintain instead that ideas are tools, which people make use of to cope with the world they experience (ibid.). For Dewey, we can seek truth only in continuous and situated enquiry into lived reality, which is always open to revision and tuning (Dewey 2013 [1938]; Hildebrand 2008). While Dewey claimed that the ‘unstable’ way of life in the US at the end of the 19th century was formative of the emergence of pragmatism, after which its central tenets eroded in the popular understanding, giving way to an impoverished view in which pragmatism is lacking in principles. More recently, however, the original approach has regained a strong resonance, presumably amid a hunger for appreciating lived reality and social experience in our reasoning about the world (Lorino 2018).

On ontological level, pragmatism holds, further, that enquiry into a problem proceeds from the relational qualities of the phenomenon at hand, rather than reducing it to a set of components with particular qualities. It regards phenomena as situated in a specific time and space, with dependence on changing material, social, and historical qualities (Hildebrandt 2008; for a relational perspective on design, see Agid and Chin 2019; Akama and Light 2020). Consequentially, to understand ‘how things are’ in lived reality, we need to study the constellation of effects in which a given practice comes about (Dewey 2013 [1938]). For my study, this was particularly relevant for examining what the practices within DIY activities mean to those taking part. I found it applicable also for studying which socio-material settings enable the practices in question and, accordingly, understanding how different people regard different things as infrastructure for what they practice. At the same time, this approach entails thinking of findings evident from multiple sites less as generalisable knowledge than as
recurrent patterns, which form foundations for further enquiry in another location at another time.

Finally, the epistemic frame for my study – i.e., my positioning on how we can know what – was informed largely by an STS-derived understanding of the interwoven nature of materiality and the social (Hackett et al. 2008). While Dewey’s pragmatism was formative to practice theory and activity theory, his understanding was devoid of any notion of material tools, whereby the practice or activity may be mediated (Miettinen et al. 2012). Therefore, I completed my research design through a new materialist understanding wherein enquiry and knowledge-making are contingent not only on humans but also on the non-human world (an understanding at the core of STS studies; see Fox and Alldred 2017). Through this, I could delve into what people do with stuff and the ends for which they operationalise that stuff as tools (Verbeek 2005).

3.2. The data-collection process

Over the decades, succeeding generations of researchers have developed distinct understandings of what characterises qualitative research, with one more recent pillar of thought being the transparency of the research process (Miles et al. 2014; Denzin and Lincoln 2018). To this end, this subsection shows the various steps in gathering my data before the discussion of my data-analysis approach follows. Throughout, it should be borne in mind that these are not distinct steps so much as activities that co-constitute each other and demonstrate some overlap.

I dedicated a significant amount of my first year as a doctoral student to surveying the literature or, rather, conducting several ‘bundles’ of reviews. I started by examining DIY as a form of sustainable everyday practice and considered the PD approach to infrastructuring as a lens to the everyday organisation of communities. With this development, my interest during the first year centred largely on 1) identifying community sites that enable individuals to learn new making, repair and sustainability related skills; 2) how these sites come to be; and 3) the effects of the site’s specifics (e.g., its location and organisation) and what form of intervention would be suitable for better understanding them. Then, in the second year of my
studies, I developed a deeper interest in STS perspectives on the making of expertise and in the interweaving of the social and the material in general.

While my initial aim was to set up a space myself at a vacant industrial site, it became clear within the first few months that I could not on my own ‘kick start’ such a study, that closely resembles many of PD’s long-term interventions, within the time span of doctoral research. Therefore, in the second year of my studies, I set out to find several community spaces engaged in DIY activities in and near Helsinki and Berlin, the locations between which I alternate on a bimonthly basis. The first interesting site I encountered, referred to as ‘Temporary’, was later revamped as Kuusi Palaa (the name combines two Finnish terms, with six distinct meanings, and thereby underscores the experimentality of the facility) and ultimately ceased operation soon after shifting from being a temporary, grant-based project to acting as a community run co-operative. In parallel, the often popular but rather prosaic events at the Berlin site Trial & Error led me to wonder how such a space’s existence could span 10 years in a city such as Berlin, which has rapidly gentrified.

These observations and musings proved influential; around this time, my interest started to shift toward how participants’ relatively heterogeneous structures and interests are bound together over time, with regard both to funding and to internal decision-making. I found them relatively heterogeneous insofar as I only rarely encountered a coming together of what Mayer (2013) called the ‘culturally discontented’ and the materially ‘dispossessed’, yet it became clear at the same time that people engaged with these communities for a host of reasons. Furthermore, I gradually came to recognise that, despite interesting design-research methods such as cultural probes (Gaver et al. 1999), it would be difficult to track adjustments in the lifestyle of individual participants. Finally, rather than normative articulation of suitable lifestyles, I became more interested in how different visions of sustainable lifestyles are negotiated in lived reality.

From this starting position, I searched for sites I could examine over the remaining two years of my studies, a search that entailed several practical concerns. Firstly, the phenomenon of interest to me was not clearly defined via a label such as ‘maker’ or ‘fab lab’, and the term ‘DIY’ – as explained earlier in the dissertation – encompasses diverse meanings and practices. I was interested in the apparent growth in the number of collectives with a
dedicated space for material engagement and an underlying social and ecological purpose. I found a few research contributions dealing with specific sites labelled as repair cafés, sewing cafés, or libraries of things, but there was nothing that summarised these endeavours under some sort of umbrella term. Through a confluence of the literature, supportive research colleagues, and coincidence, I discovered several suitable sites. While enriching my project’s breadth, both the unexpected closing of one site soon after this and the rather slow unfolding of another site’s establishment underlines just how much of doing research – especially when under funding and time constraints – depends on constant adaptation of the research design, including the use of ‘cases of convenience’ (Koivu and Hinze 2017).

Hence, the choice of settings comprises both strategic selection and convenience. The sites are cases of convenience in that all were close to Helsinki and Berlin, my cities of residence. Furthermore, I learned of some of them through my network, which made the introductions and establishing of trustful relations easier. However, I chose these sites over multiple others for several strategic reasons. As noted in the introduction, I was keen to observe negotiations both in the emergence phase and in contexts of endurance. Considering the first, I found a second example after the closing of Temporary / Kuusi Pala, called the Test Site, which provided me with a convenient opportunity to accompany the actors from the very beginning onward. With regards to the endurance of sites, the 10-year existence of Trial & Error was striking, and I had not previously encountered any case with such a history.

It was difficult to engage with communities of this sort. After all, doing so requires building and maintaining trust, and authors working at the intersection of design and anthropology have even posited that ways of reacting to and co-create with ordinary citizens could form one facet of success (Otto and Smith 2013). Some scholars working in PD and community research have highlighted that being a full member is one useful approach (Botero and Saad-Sulonen 2019), while others have pointed out the variety of roles that a researcher working with community groups may occupy, which range from invader to collaborator to advocate (Le Dantec and Fox 2015). In a similar manner, Fox et al. (2020) have referred to collective responsibility, in describing how, for example, funding affects the creation and maintaining of partnerships in the long term. Whilst I
was neither bound up in any complex relations with stakeholders nor restricted by funding shortages, it became difficult not to be an invader on occasion, when I had to schedule regular visits to several sites, in different

<table>
<thead>
<tr>
<th></th>
<th>Genre</th>
<th>People</th>
<th>Infrastructure</th>
<th>Start year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dietenheim zieht an (Ulm, GER)</td>
<td>Sewing café, real-world lab</td>
<td>~5–20</td>
<td>Textile workshop</td>
<td>2016</td>
</tr>
<tr>
<td>Temporary / Kuusi Palaa (Helsinki, FIN)</td>
<td>Open community space</td>
<td>~5–40</td>
<td>Event space (about 100 m²) and garden</td>
<td>2016/2018</td>
</tr>
<tr>
<td>Trial &amp; Error (Berlin, GER)</td>
<td>Open workshop, community garden, cultural laboratory</td>
<td>~5–20</td>
<td>Event space (about 100 m²) and garden</td>
<td>2010</td>
</tr>
<tr>
<td>Test Site (Helsinki, FIN)</td>
<td>Community garden, open community space</td>
<td>~5–20</td>
<td>Outdoor space on the campus (about 150 m²)</td>
<td>2018</td>
</tr>
<tr>
<td>Hebewerk (Eberswalde, GER)</td>
<td>Open workshop, open technology lab, maker space, repair café</td>
<td>~5–40</td>
<td>CNC mill and general workshop</td>
<td>2012</td>
</tr>
<tr>
<td>Konglomerat (Dresden, GER)</td>
<td>Open workshop</td>
<td>~5–40</td>
<td>3D printer, CNC mill, laser cutter, metal workshop, woodworking shop, plastics recycling, textiles, silkscreen facilities, digital printing, photo studio, electronics, and materials agency</td>
<td>2010</td>
</tr>
<tr>
<td>FabLab Cottbus (Cottbus, GER)</td>
<td>Open workshop, fab lab, repair café</td>
<td>~5–40</td>
<td>Woodworking and metal workshop, electronics lab, 3D printing and milling area, and textile workshop</td>
<td>2013</td>
</tr>
</tbody>
</table>
Methodology

countries. Indeed, on multiple visits I felt that I was just ‘dropping in’ and then leaving again. The combined influence of these practical concerns and mounting worries about what an intervention could add to the overall agenda of the communities led me to gradually abandon my initial plan and align my goals with actual circumstances. This meant that, rather than following and co-organising one site in depth as I had planned at first, I focused on ethnographic observations across several sites. This enabled an important part of the project: cross-checking my findings and following sites at different stages of development.

Where I managed to spend significant time in the field, several site-specific opportunities and obstacles arose. While I was collecting data for P2 and P3, the specifics of Test Site, in the Helsinki area, allowed for very close interactions, and my role was close to that of an ordinary member of the group stepping into the picture with relevant understanding of what was happening. This position was partly due to teaching and advising some of the students involved in the site’s activities (e.g., a student writing his master’s thesis on tools for decentralised organising). At the same time, these circumstances left me a rather passive observer in, for instance, the unfolding of collective decision-making processes. At the sites in Germany, I remained an active observer but never came anywhere close to being a full member, mainly for reason of time constraints. By the same token, while locations in the Helsinki area afforded more spontaneous interaction, the German sites offered clear advantages related to language and interaction in the field, which I began to fully appreciate only with time.

Having mention ‘sites’ and ‘cases’, I will in the following discuss multi-sited ethnography and in-depth single-case studies which are at the core of the data collection in my research. Ethnography was developed as a method of studying foreign peoples and was initially applied by anthropologists to study social life in context (Malinowski 2014 [1922]). Rather than test hypotheses, ethnographers explore specific phenomena in their context, hence often relying on a small set of cases (Hammersley and Atkinson 2007). The mid-twentieth century saw the method’s circulation to sociologists, who, instead of observing ‘foreign’ tribes, used it to understand how people behave in smaller groups such as hobby collectives (Flick 2009). A few decades later, when designers started to engage in industrial design and research the needs of specific users, ethnography became a standard
approach in design research too. While traditional implementations focus on not influencing the research setting, some design researchers, interested in a more activist stance to design, argue for utilising ethnography to speculate about what could be otherwise in the future (Clarke 2016). I found myself experiencing this tension – aiming to study how people behave, what perspectives they open to me, but also to understand this as a hint to what might be otherwise.

However, in comparison to traditional ethnography as embedded in the chosen conditions, researchers have more recently employed what is known as multi-sited ethnography, a modality that Marcus (1995) has claimed arose in response to phenomena that take place across multiple times and spaces. Following a phenomenon across sites is necessary if one hopes to account for the circulation of objects, meanings, and identities, which traditional ethnographic studies at a single site could not achieve. Since this approach serves following something across multiple sites, it features prominently in studies of commodities (cf. Appadurai 2013) and in STS analyses of science-making (cf. Latour 1987). A research design in accordance with new materialist social enquiry should focus on capacities, things’ effects, and their limitations (Fox and Alldred 2017). As for my work specifically, two of the sites were at the centre of my research due to my roughly two years’ engagement there, and I have referred to these in terms of case studies. The case-study approach is one that uses multiple data sources in order to study a phenomenon in its naturalistic context (Piekkari et al. 2009). I operationalised this approach to study the two initiatives in depth (Ragin 1992), for considering emergence (for P2 and P3) and external relations (P4).

Finally, to follow how participants interacted with things and other people in the communities, I engaged in what ethnographers usually denote as participant observation. As recent studies of communities for making (e.g., Boeva 2018) have highlighted, these settings, however, require increased interaction and practical engagement, rather than distanced ‘observation’. Therefore, I follow Boeva who argues that Collins and Pinch’s (1982) notion of participant comprehension is more appropriate in this connection. In my first step with this approach, I created ‘headnotes’: brief scribblings of key words that serve as an anchor for remembering the peculiarities observed or overheard in the field (Sanjek 1990), which I subsequently
turned into lengthier field notes (Walford 2009). In the personal accounts I wrote when in the field and producing such notes, I focused chiefly on engagement with the material, how people collaborate, and the surrounding space and the atmosphere of being in it. While I struggled with the approach at first, it revealed itself to be a door to a whole new world of detail. I triangulated these descriptions with semi-structured interviews, which are another commonly used method in ethnography. This style of interview proceeds from a given outline of prepared questions yet purposefully leaves space to follow emerging topics as needed, thus combining structure and openness (Flick 2009). Together, participant observation/comprehension, semi-structured interviews, mind maps, and (for some sites) relevant internal documents created a detailed picture of each site and its organisation.

To summarise the approach so far: in aims of better grasping the phenomenon of DIY initiatives, I conducted multi-sited ethnography in which I relied primarily on semi-structured interviews and an engaged form of participant observation, with close interactions in the field. This approach to understanding the flows and processes within the heterogeneous associations of things and people was the result of explorative and appreciative enquiry in which I had to shift my research focus to account for difficulties in collecting data within the given time frame. It was also a consequence of discovering more relevant gaps in the literature, which were not obvious to me when the research began. I devote the remainder of the section to a brief presentation of the process of analysing the data sets thus collected.

Table 5: Collection of the data

<table>
<thead>
<tr>
<th>Site</th>
<th>Timing</th>
<th>Paper and objectives</th>
<th>Methods and data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dietenheim sieht an</td>
<td>July 2017</td>
<td>P1: To participate in DIY events, find informants, and understand the everyday for the organisation and how it emerged</td>
<td>Interview with the founder and organiser, ≈75 minutes</td>
</tr>
<tr>
<td>(Ulm, GER)</td>
<td></td>
<td></td>
<td>≈6 hours’ participant observation</td>
</tr>
<tr>
<td>Site</td>
<td>Dates</td>
<td>Methodology</td>
<td>Data Collection</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Temporary / Kuusi Palaa</td>
<td>August–December 2017</td>
<td>See cell just above</td>
<td>Interview with the founder and organiser, ~75 minutes</td>
</tr>
<tr>
<td>(Helsinki, FIN)</td>
<td></td>
<td></td>
<td>~8 hours’ participant observation</td>
</tr>
<tr>
<td>Trial &amp; Error</td>
<td>August 2017</td>
<td>See cell just above</td>
<td>Interview with the founder and organiser, ~75 minutes</td>
</tr>
<tr>
<td>(Berlin, GER)</td>
<td></td>
<td></td>
<td>~2 hours’ participant observation</td>
</tr>
<tr>
<td></td>
<td>January 2019 – May 2020</td>
<td>P4: To participate in DIY events, find interview partners, and understand</td>
<td>9 semi-structured interviews:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the everyday for the organisation and how it endures</td>
<td>The organiser, ~60 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OWA organisers, 3 × ~60 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Local administrators, 3 × ~30 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The OWA spokesperson, 2 × ~70 minutes each</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.5 years of participant observation roughly every two months, ~15 hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Examination of internal documents and advertisement material</td>
</tr>
<tr>
<td>Test Site</td>
<td>January 2018 – January 2019</td>
<td>P2 and P3: To participate in DIY events, find interview partners, and</td>
<td>4 semi-structured interviews, ~45 minutes each</td>
</tr>
<tr>
<td>(Helsinki, FIN)</td>
<td></td>
<td>understand the everyday for the organisation and how this takes shape</td>
<td>1.5 years of regular (weekly–bimonthly) participation in team meetings, ~50 hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Review of internal strategy documents</td>
</tr>
</tbody>
</table>
Methodology

Since I would rely mostly on semi-structured interviews and fieldnotes for all four papers, coding these written data sets was the first part of analysing my data. This process resembles a form of sifting, as I found myself working through the many, sometimes mutually contradictory responses of interviewees in efforts to figure out which ones were important. Coding can be classified as either inductive, open (or emic) coding or deductive (or etic) coding (Flick 2009; Miles et al. 2014): while deductive coding relies on prior, researcher-defined categories, inductive or open coding assigns a set of open, preliminary codes on the basis of emerging themes. I argue that the process is never purely inductive, though, since the research questions guide the interviews and field visits, rendering some categories that emerge in the first round of coding foreseeable.

In all four studies I conducted, I relied on open coding initially, to account for what the practitioners in the field deem important and to reveal

3.3. Data analysis

Since I would rely mostly on semi-structured interviews and fieldnotes for all four papers, coding these written data sets was the first part of analysing my data. This process resembles a form of sifting, as I found myself working through the many, sometimes mutually contradictory responses of interviewees in efforts to figure out which ones were important. Coding can be classified as either inductive, open (or emic) coding or deductive (or etic) coding (Flick 2009; Miles et al. 2014): while deductive coding relies on prior, researcher-defined categories, inductive or open coding assigns a set of open, preliminary codes on the basis of emerging themes. I argue that the process is never purely inductive, though, since the research questions guide the interviews and field visits, rendering some categories that emerge in the first round of coding foreseeable.

In all four studies I conducted, I relied on open coding initially, to account for what the practitioners in the field deem important and to reveal
the multiplicity of their views. However, I used deductive coding also, where key elements for the study were clearly defined beforehand. In my second round of coding, I considered the first-round codes and created bundles of themes. This stage alone quite often required several rounds of cross-reading of the data and moving back and forth between inductive and deductive coding. Especially near the start of the doctoral research, I found this process the most challenging, due to its interpretative nature. In all cases, the final output from my coding was a set of approximately 1–3 themes or tensions that appeared to be related and important – whether this was because of the time or effort dedicated to them in the participants’ responses, because of repeated mention across interviews and sites, or because of how they drew the various perspectives of interviewees together in a sensible manner.

The work relied on two forms of triangulation for strengthening the reading of my data – namely, author triangulation and data triangulation, both of which can serve clarity of conjuncture but equally aid in accounting for differences (Flick 2009). Firstly, when working with co-authors, I opened the codes for discussion, to see whether they appeared sensible to a researcher familiar with the topic who was not involved in the interviews. Secondly, I analysed material from several sources: fieldnotes, photos, official reports, and internal documents of the relevant actors. While the number of photographs taken is insufficient for ascribing fundamental importance to this source in the sense of explicit visual research (Rose 2012), this source proved useful for fully capturing the role of materiality and practices across the sites. Likewise, while I refrained from subjecting the internal documents and external reports to discourse analysis, their existence helped in uncovering the relation-building within the organisations, the reaching out to established actors, and ways of portraying these relations (See appendix for further details about these documents). Learning about and using situational analysis (Clarke 2005) was crucial in this respect for P3, wherein key discourses, social worlds, and the actors’ positioning were mapped. While Clarke’s approach has a constructivist orientation, her various mappings of how actors make sense of the world appear compatible with pragmatist enquiry, which highlights actors’ experience. While I did not follow exactly the same procedure for P4, the experience was influential insofar as I gained significant confidence in
working through alternative readings of my data and in operationalising the resulting mind maps.

Over time, I gradually also grew confident in using drawings, maps, or diagrams as a sense-making tool (in retrospect, it appears striking to me that, without a social-sciences background, I had evidently internalised that such an approach would not be proper). The process was eased in some measure by encountering Becker’s Tricks of the Trade (1998) in which he ponders on the right lens of analysis. In the book, he recommends answering what the phenomenon is a case of by describing the phenomenon at hand without using any jargon but rather with simple descriptive words. This marked the point where I started paying more attention to my scribbles and regarding this technique as a legitimate form of sense-making within design research.

Concurrently, I gained greater awareness of different standpoints and perspectives I could adopt when sifting through the data. I found it crucial to understand the phenomenon of DIY collectives and their spaces from multiple perspectives, extending from the events and practices played out to organisers’ point of view on the purpose of the space and, further, to relations to external actors. Finally, considering my own role as a researcher became increasingly important to me. Whereas earlier in the project I had rarely contemplated having some form of agency by virtue of doing research, in the second half of it I dealt more with the association between highlighting certain phenomena and thereby adding legitimacy to them. I found it curious to observe myself pondering whether the given phenomenon appears important enough to outsiders while from a pragmatist angle focusing on what participants deemed important in their experience.

To synthesise the above: The philosophical assumptions underpinning my work, highlighted the importance of understanding phenomena as situated in specific relations. Coupling this approach with an STS-derived understanding of knowledge making, wherein materiality is entangled with the social world, influenced the research methods chosen to conduct ethnographic data across seven distinct sites. Furthermore, the underlying philosophy influenced the triangulation applied: cross-checking several data sets with colleagues and understanding scribbles and descriptive labelling as a source of clarity were key to advancing the analysis.
Advertisement material by the OWA
Source: Author
4. Summary of the research articles

This chapter presents a synthesising summary of the results of each of the respective research papers. All formed integral parts of the doctoral project and contributed to answering its research questions. For the first paper, I was the sole author, while I was the lead author of the other three. They are presented separately as originally produced: P2 as a peer-reviewed conference contribution and the other papers as peer-reviewed journal contributions.

4.1. Organising places for making and repairing


The first paper introduces the main theoretical frameworks applied throughout the project and offers a literature review addressing the history and development of do-it-yourself activities, specifically the DIT notion. Although research into DIY activities and making was reinvigorated over the course of the 2010s, the appearance of spaces such as open workshops,
‘library of things’, repair cafés, or bicycle kitchens remained a marginal topic. Therefore, with P1 I explored three such spaces, which were created by dedicated people as laboratories for learning about and exploring sustainability-related topics in a self-directed manner. These were a sewing café close to Ulm, an experimental space in Helsinki, and a culture lab in Berlin that provided space for various DIY activities. I used both semi-structured interviews with the organisers and participant observation to examine which collective resources were designed, how they were reproduced, and how they support alternative practices and relations among participants.

With regard to the development of DIY, the paper tracks how DIY operations meet several needs. The literature review revealed that, both historically and at the time of writing (Atkinson 2006; Cohen 2017), DIY practices express both notions of escape and political engagement, with their outputs stretching from making one’s home more comfortable to questioning scientific expertise or gendered work, their ethos extending from use of leisure time to productivity or even self-determination. The main change with DIY, I argue in the paper, lies in the appearance of collective and public spaces instead of homes and garages as a centre of activity. Therefore, how collectives are organised and how responsibilities are handed over manifest themselves as important aspects of contemporary DIY. While the collectives observed are in the Global North, their organisation and struggles echo Escobar’s (2018) notion of autonomia, referring to how collectives in the Global South produce the resources to steer their activities in relative independence.

Consequently, on conceptual level I used the lens of infrastructuring to interrogate how such relative autonomy is arranged, especially in light of the high transience of people in such spaces and the spaces’ financial and space-related uncertainty. From a PD standpoint, the concept of infrastructuring highlights design for future use instead of designing within project time (Ehn 2008; Karasti 2014). Therefore, this approach aids in understanding the creative workarounds applied by the organisers to reproduce the necessary resources while keeping the collective open for newly emerging needs, which are likely to appear over time and as participant bases change. For a fuller picture of how these spaces could support autonomy in day-to-day life, I further introduced practice theory (PT). Here, practices are regular performances that, while changing only
slowly, simultaneously must be constantly remade. For instance, Shove et al.'s framework depicts practices as composed of materials, competencies, and meanings (2012). In the context of DIY, PT highlights sustainability efforts as not only involving questions of policies and infrastructure but also needing to be practiced in routines of everyday life. Learning how to repair, being able to borrow and swap, and learning how to organise as a collective all are ways of bringing about such changes.

In all three cases, the space was a central resource, made available either through co-operatives or via changing of the locations over time in response to developments in rental conditions. Also evident in all cases was the importance of co-operation among participants in learning new skills, alongside general curiosity about the workings and value of the ‘stuff’ around us. The study highlighted that problems often appeared in connection with the transience of people (i.e., participation turnover) and with the fact that user groups with quite different foci meet in the spaces. In this regard, all cases displayed an ongoing, consuming concern with developing trust and modes for hand-over of responsibilities and for enabling genuine participation.

The results reported in this article highlight how contemporary collective DIY practices satisfy a wide spectrum of needs, encompassing those for leisure pursuits, self-development, and exercise of resourcefulness but also various ways of relating to humans and the non-human environment. Secondly, they underscore the importance of tangible and intangible resources alike for collective DIY, including the space itself, governance of that space, appropriate hand-over of responsibilities, and availability of such practical knowledge. In this regard, one of the main lessons for me lay in how the organisers’ everyday work to reproduce the resources in a continuous manner echoes the thriftiness of DIY itself. Finally, again, P1 proved pivotal in laying the theoretical foundations for my dissertation project, especially in that it highlights the role of mundane, everyday practices and materials while also providing a design perspective on the reproduction of these. The notion of infrastructuring, blurry as it may be at times, proved vital for broadening the notion of design to cover those creative workarounds in people’s everyday experience that enable development beyond project time.
4.2. Making utopias material

Hector, Philip, and Mikko Jalas. 2019. ‘What matters when turning utopias into material.’ NORDES (8).

Paper 2 takes as a starting point how the needs satisfied by DIY are met in the emergence of a space and its initial negotiation among those taking part in the endeavour. For this paper, then, I undertook an in-depth case study examining the initial struggles of Test Site, an on-campus student initiative for DIY, over its first year of existence. The students wanted to test and develop their understanding of sustainability ‘outside’, as opposed to in the teaching content, which they experienced as theoretical and removed from the real world. While their visions were not radical, they were still utopian in the sense of a desire to create a better place, specifically one that, rather than being predefined, should embody process-led enquiry. For the paper, we employed interviews and participant observation to examine how usefulness was negotiated among the internal stakeholders but also with the external hosting institution, alongside the limitations that appeared as this process unfolded.

On conceptual level, we situated this phenomenon via the notions of laboratories and utopia. Labs, with roots in science, evoke one meaning of experimenting and testing – namely, the construction of scientific facts in confined spaces (Latour 1992). Simultaneously, however, the word ‘experimenting’ commonly refers also to playful, open-ended material exploration. Utopianism, in turn, offers a useful perspective on sustainability in that it entails awareness that we do not live in the best possible world (Callenbach 1978). Our focus was on the utopia not in its original sense (a fixed end state) but, rather, as expressing the importance of open processes and roads for reaching a better place (Mannheim 2013). This led us to understand both everyday aspects of governance for jointly specifying what is sought and alignment with existing structures as essential. We suggested the concept of materialised utopias to highlight the mundane and non-futuristic aspects of future-making.

We took this perspective for reflecting on our understanding of design and its inherent connection to utopianism and futures. From the Arts and Crafts movement’s restorationist plea for a return to natural experiences,
through modernist design’s bold and spectacular visions, to post-modernism’s inherent criticism of such centrally planned progress, these approaches display utopias reliant on material and technical mediation (Dorrestijn and Verbeek 2013). Especially striking are current formats connected with speculative design, which underscore how vital physical objects are for identifying issues rather than providing generic solutions. Furthermore, they strongly attest to the importance of connecting what is desired with what is at hand, thereby calling to mind the notion of adhocism.

In the case of Test Site, people gathered to create a site to test certain visions of sustainability by highly practical means, such as working with food waste, possible energy solutions, and alternative dwellings, and set out to find useful resources. Initially, the site hosted a multitude of small projects, but over time the collective aspect gained importance. Participation in materialising the utopian ideas was limited by issues related to establishing governance principles, decision-making processes, meeting routines and sharing online meeting summaries, definition of roles, and general transience of participants. The participation turnover had to do with divergent understandings of the site’s purpose or, where new participants’ deeper engagement was lacking, with trouble even stating such a purpose. Finally, we saw tensions due to differences in notions of utility between the students and the host institution. These had consequential impact on the development of the site.

This paper’s contribution to the thesis project entailed a richer understanding of approaches to utopianism and future-making specifically in the realm of design. On conceptual level, the work for P2 assisted me in thinking anew about design’s historical positioning concerning collective organising around better futures and about how this might be extended in the present day through notions connected with repair. The idea of repair at not material but socio-material level proved particularly vital for further enquiry. Our fieldwork underscored how much differing visions and understandings of usefulness need to be aligned with what is at hand but also that these visions come up against both institutional structures and practical needs for efficacy. My thinking for later stages of the project was informed especially by the utopian notion of an open space and how productive misunderstandings can draw more people to such an endeavour but also hamper collective development. Consequently, the enquiry for P2
identified the role of materiality as a stabilising factor in such open DIY initiatives, a role I would explore further.

4.3. Experimenting with sustainability education outside


From attempts to map the negotiation of usefulness in P2’s Test Site case, it appeared necessary to deepen the analysis, to inform my understanding of how stakeholders project meanings onto an open-ended experiment and what is ultimately learned from that experiment. With P3, we continued the enquiry into Test Site, with nearly two years of observation alltogether. The observation data were supplemented by internal documents and communication materials such as invitation posters. To better capture how meanings were negotiated and actors legitimised their actions, we drew on situational analysis, an approach in which mapping helps the researcher include varied views of research participants (Clarke 2005). We asked how the site evolved, what was experimental about it, what was learned, and what the site meant to participants.

The conceptual underpinnings entailed examining Test Site in terms of experimentation – specifically, experimental governance. While experimental governance is increasingly seen as a standard mode of equitable participation by citizens, especially with regard to sustainability challenges (Evans et al. 2016), some of the actors involved are keener on testing of hypotheses, and therefore expect deliverables, while other actors are more interested in self-directed production of knowledge and in negotiating what is deemed relevant for sustainability-related knowledge-making (Hodson and Marvin 2017). Accordingly, scholars have examined the disjunctive understandings of return on investment that such experiments bring in, among them techno-scientific learning and proof of impact, on one hand, and situated learning and acknowledgement of collective responsibilities, on the other (Heiskanen et al. 2017; Hinchliffe et al. 2007). Such diver-
gence in expectations is likely to affect both negotiation and the capacity-building within experiments.

The negotiation of what is found relevant for enquiry and the overall production of sustainability ‘facts’ (Lave 2012) becomes especially interesting in the context of campus sustainability, given the prominent role of universities as guardian of research. Nevertheless, the various research departments’ internal discussion of sustainability knowledge’s production has been centred largely on techno-solutionist approaches, living-lab settings, on-campus inclusiveness efforts and smart solutions, with less focus on capacity-building among students for negotiation of what sustainability means in lived practice.

This study drew our attention to the students’ wish to achieve autonomy by venturing outside the classroom. They stressed that the forms of sustainability solutions exported to other countries differ from what was presented as useful in the classroom setting for their home country, hence, that a need to experiment with other solutions was clear. Furthermore, we showed that two distinct, yet co-constitutive outcomes can be observed in such experiments. One consists of projects, accompanied by renderings or photos, that showcase outcomes. We could describe these as demonstrations rather than ongoing experiments. The other is true experimenting, with material or, as was the primary action in our case, with the ways the collective organises itself.

The paper’s main contribution lies in the discussion of joint production of sustainability knowledge by several stakeholder groups through the modality of an experiment. We showed that, while this mode is attractive, stakeholders differed markedly in their motivations for finding it so. Whereas technical lessons and testing of solutions for real-world problems typically receive great attention, we found the most important questions to involve how people strive for autonomy in their project, judge what warrants attention, and create governance principles amidst structural limitations. In the setting considered in P3, the role of collectives’ social learning, especially with regard to the time-intense processes of working with others – something that has remained at the periphery in the literature on sustainability experiments – proved to be a source of frustration but also the key to learning overall.

The issue of the need for proof of impacts points to P3’s second import-
Summary of the research articles

ant contribution. It relates to the effects of a neoliberal discourse within sustainability experimentation and universities’ management, yet at the same time is equally helpful for participants, encouraging their commitment and participation as a blank canvas cannot. In this regard, the open-endedness of agendas in experimentation, identified in P2, proves to be both blessing and burden. In P3, we examined this matter further to see which outcomes assist in the stabilisation of experiments. While the paper does not explicitly state the STS origin of demonstration – something clearly different from experiments yet often conflated with them – this notion was fundamental for our more nuanced understanding of testing as a modality.

Finally, the inability of the experiment to change the conditions for experimenting points strongly to the importance of, among other factors, feeding back the results and learning created in the experiment to those participating, the hosting institutions among them.

4.4. Repair in between DIY spaces and institutions


With DIY collectives becoming increasingly active in providing resources to citizens yet remaining prone to a brief existence, their relationships with institutional arrangements are of interest. Whereas prior scholarship examined them through a simple dichotomy of bottom-up vs. top-down city-making, P4’s examination of these actors’ work suggests that they engage in a complicated relation to become and stay relevant to each other. For our study, we took as a starting point a DIY initiative in Berlin that had been operating for a decade and three further initiatives, in the vicinity of the city. We completed the list of actors examined with two institutional entities supporting these collectives, the OWA umbrella organisation and a public–private intermediary called Quarter Management (QM). Through interviews with the organisers, we researched which resources were essential for the operation of the various DIY initiatives, who was involved in
making them available, and how the initiatives claimed relevance so as to receive these resources.

On conceptual level our aim was to ascertain both what PD can contribute to DIY citizen initiatives and, even more importantly, how PD can be thought of differently through the lens of these groups (Agid 2016). To this end, we began by examining the ambiguous political potential of DIY as a form of everyday resistance and delved into the questions that the advent of dedicated collective forms of DIY (Schlosberg and Coles 2016) begs for on formal organising of roles, resource flows, and – most importantly – longevity. We proceeded to draw on three distinct concepts applied in PD: infrastructuring, workarounds, and institutioning. While the first of these is focused on the processual aspects of how groups make resources available beyond project time (Karasti et al. 2018), the notion of workarounds (Alter 2014) underscores the day-to-day hacks of laypersons when meeting material limitations. Finally, the concept of institutioning again is useful as it takes institutions as a site of ongoing change and highlights the need to engage with institutions if one wishes to re-politicise participatory design (Huybrechts et al. 2017).

Interviews with the DIY activities’ organisers underscored that three distinct practitioner groups were frequenting their spaces – primarily single-visit practitioners, a complementing group of regulars who supply knowledge to others, and those who use the space for explorative projects (local adaptations of existing concepts, for the most part). Equally distinct are the five roles that organisers highlighted. These were taking care of the tools and introducing them to newcomers, handling social care-taking such as aligning people and projects, managing the finances, looking after public relations, and seeing to networking with other institutions. While not explicitly cited as a role, we clearly saw producing documentation – an oft-mentioned problem – as a sixth role.

These roles support arrangements for the flows of resources, which we ended up distinguishing between explicit and implicit ones. Among the former are space, funding, tools, and equipment such as furniture. Foremost among the implicit ones in our setting is third party insurance – provided by the OWA – which the specifics of German law made available to any member of the umbrella organisation. Additional important resources in the ‘implicit’ category are organisational/bureaucratic blueprints and the le-
gitiacy derived from collaborating with established institutions. To make these available, institutions’ officials apply creative hacks and workarounds, thereby underscoring institutions as sites of active change. A further finding connected to this is that the initiatives, in turn, provide the institutional arrangements with resources, such as local knowledge and authenticity, and with more flexible organisation and production opportunities. This exchange is clearly restricted by lack of competencies in dialogue and gaps in understanding of the parties’ different work cultures and needs.

We concluded that if the interrelations between DIY initiatives and institutional entities are to last, they require three types of what we term ‘generative repair’. Firstly, the collectives must be formalised through dedicated roles and an umbrella organisation’s structure. Secondly, since they are dependent on resources from outside institutional actors, gaining those resources is contingent on being relevant to these institutions. The importance of the latter is only underscored by the resources that the collective can offer in return. At the same time, the DIY initiative has to walk a narrow line: it must remain somewhat removed from institutions if it is to stay relevant to the participating citizens.

The final paper contributes to the project in several important ways. Firstly, it complements the enquiry for P1, which dealt mainly with the internal work of initiatives; this study devoted equal attention to the surrounding institutional actors. While our framework characterising the generative repair of these actors reflects context-specific peculiarities, it nonetheless serves as a starting point to mapping the complex relations of citizens’ material engagement with city officials. Secondly, within these relations we highlighted the importance of implicit resources such as insurance and access to knowledge of navigating bureaucracy, alongside how these resources are made available by institutions’ officials. Tackling this puzzle proved key to making the argument that seemingly trivial factors matter more than revolutionary or thought-provoking ideas do for the emergence and endurance of DIY collectives and likely also other forms of material forms of citizen engagement. With regard to the latter, our most important advance to scholarship lies in distinction of the nature of their struggles for sustained existence between infrastructuring on a socio-material level as discussed by PD scholars, workarounds to circumvent material limitations, and building relevance. This differentiation has much to offer
with regard to discussion surrounding the legitimacy of amateur experts. Finally, the notion of design as repair or as continuous rearrangement of what is available crystallised more prominently in this enquiry than in P2. It holds potential for helping us think of design at large as an ongoing process of participating in the making of our socio-material environments, instead of creating and living with set-in-stone environments.
Trial & Error.
Source: author
5. Discussing design as continuous repair

The contributions of the research presented in the previous chapter extend beyond those of the individual papers. This chapter summarises the advances made at the level of theory, with respect to relevant literature and empirical studies in the field. Section 5.1 addresses the main research question in this regard, after which the guiding subsidiary questions are dealt with (in sections 5.2 and 5.3). The chapter concludes with a synthesising summary of the key contributions.

5.1. Relational infrastructure in constant beta mode

*RQ1: How do DIY initiatives emerge and endure as everyday socio-material infrastructure for a 'make, test, and repair' culture?*

The results presented in the literature reviewed, and the empirical studies undertaken, demonstrate, firstly, the long historical pedigree and, secondly, the breadth of meanings associated with DIY. That said, as Langreiter and Löffler (2016) argue, while DIY is nothing new, currently unfolding debates position DIY practices as particularly empowering and collective.
My understanding of the DIY at the sites I observed over the last four years is largely in line with this perspective, yet ‘empowerment’ seems to strike a note too close to radical democratic change. Although the actors I followed and who spoke with me emphasised the collective aspect of the notion and an underlying wish to demonstrate that things could be otherwise, the initiatives arose also to satisfy needs for local, non-market production and consumption (Hielscher and Smith 2014), material exploration, and demonstration of one’s abilities (Bialski et al. 2015; Baier et al. 2016). While actors in my studies often claimed to use their space in a particular manner of collective intervention that is sharply distinct from maker-movement claims of self-responsibility and individual-level growth (Turner 2018), the phenomenon appears much more multifaceted than either.

More precisely, organisers of longer-lived sites emphasised the existence of a variety of use cases and, correspondingly, practitioners (see P1 and P4). Along the continuum of distributed expertise lie three main clusters described earlier on: regular, supportive practitioners, who engage as volunteers do and either wish to share specific knowledge or want to socialise (cf. Hirscher 2020a); at the same time, irregular practitioners, who visit to receive the help of the first group or even just to use free infrastructure once for a specific need, are commonplace too, with their participation partly contradicting the above-mentioned discourse; and, finally, almost all informants implicitly or explicitly mentioned practitioners who probe – whether in groups or on their own, they engage in exploratory, time-intensive projects. From what I have observed, heard, and read, these projects are usually adaptations of existing ideas, already existing in other locations, thus making the case for viewing design as repair, which I will discuss just below, in Subsection 5.1.2. While often the projects provide locally useful products or infrastructure, they rarely lead to local production schemes as advocated by the maker movement (Turner 2018), as in the case of a space-framed cargo-bike company that was developed within an OWA member entity. Equally commonplace are forms of collaboration that resemble post-growth explorations of work (Lange and Bürkner 2018) – as was visible when an organiser with Trial & Error received funding to organise workshops around self-production and maintenance of everyday items or when her colleagues had to discuss whether a charge should be imposed
Discussing design as continuous repair (and, if so, how much) for organising similar workshops.

Related to such diversity of user groups is the problem of transience of participants, as highlighted especially in P3. While the university context of Test Site brings specific timelines (e.g., connected with students’ course of study), this dynamic was frequently displayed also at some sites I studied for P1 and P4. Especially with regard to Kuusi Palaa, which I observed for P1 and that had to close soon after its rebirth, I favour Deflorian’s (2020) analysis of refuguration. In times when subjects are constantly under pressure to embrace opportunities, it is increasingly difficult to stay committed to any one option, all the more so when that option is an emergent site. On another level, this phenomenon is arguably also inherent to event-based learning modalities. Graziano and Trogal (2017) have rightly raised the question of the extent to which event-based learning can induce the dissemination of a repair culture. In this connection, I find it important to emphasise the difference between repair cafés and the like, which are purely event-based, with potentially changing locations, and settings such as open workshops, whose location is fixed and where, arguably, somewhat stronger relations may appear between the people and the place.

In addition, the observation of differently engaged participants is consistent with Meyer’s (2013) point about differential participant intensity in DIY collectives. This, in turn, brings with it divergent expectations and certain tensions, especially evident at Test Site (see P2 and P3). That said, field visits to further sites demonstrated that some initiatives actively strive to deal with these expectations. For example, on one occasion, I attended a plenum at which people discussed the ‘1–9–90’ rule that Nielsen’s (2006) found identified for online communities, under which supposedly only 1% regularly produce and maintain the group’s online content. While his observation is now highly debated, I think awareness of it is useful as a tool for aligning disparate expectations of participants, and it underscores how seriously some participants take their quest for alternative organising.

In a similar preventive manner, both Test Site and three sites studied for P4 reached a state of explicitly discussing the fluidity of roles (cf. Diani and McAdam 2003) and, consequently, informants spoke of themes rather than of person-bound responsibilities.

I followed up on these sites with regard to how they were dealing with responsibilities, and P3/P4 further demonstrated an ongoing process of
Discussing design as continuous repair

sifting through a range of decision-making tools (cf. Cabraal and Basterfield 2019) and knowledge-sharing platforms (Google Drive, Slack, Twilio, etc.) and, accordingly, determining which of them would be in accordance with the members' values. This constant trial underscores what we characterise in P2 as materialising utopias, in line with the notion of utopia as process-driven enquiry instead of fixed end state (Mannheim and Kaube 2015 [1929]). Participants have taken ideas to reality which, albeit not radically different still display a rearrangement of what was present previously. Just as the enquiry is ongoing, so is development of the day-to-day organising principles, which reflect the group's ethics-related conduct (Yates 2015). Summing up this modality, observed across all sites, one participant cited in P4 hit the nail on the head when she stated that they are in **constant beta mode**.

It is noteworthy, however, that this processual approach leads to self-selection of participants. Many people seem to find it difficult to engage in constant redefinition and openness. Therefore, not only does it seem necessary to understand differences in use cases and in participant intensity, but equally one must address a mismatch that appears between the view put forth of the initiatives or workshops as open and potential users' perception of them. On one hand, I agree with Foster (2017) about the former insofar as the sites' practice focuses less on high-tech tools than on rather simple DIY practices such as following the instructions for building something, working with seedlings, or applying similar step-by-step procedures. At the same time, however, when initiatives cater to multiple needs and potential participants must take the initiative to enter the space, and find out what the site is about, access is reduced accordingly. This paradox is consistent with findings on collaborative economies, which highlight that, despite grand appeals, most initiatives and spaces rely on a few dedicated individuals (Bradley and Pargman 2017). From this perspective, I argue that openness is a process, one that needs to be practised but will never come to complete fruition for all potential participants – it is intended well but often remains a normative wish. In Section 5.3, then, I argue for an alternative defining name to replace 'open workshop'.

Finally, the spaces I followed not only spoke to local needs and dynamics but also tried to make use of local resources. The will to redirect or redesign the flow of these resources (Schlosberg and Coles 2016) and the
Discussing design as continuous repair ensuing exchange and negotiation with other local actors appeared key for understanding the endurance of the sites. Therefore, the work on the subsidiary questions presented below explored, firstly, the various designs present in the organising and reproduction of resources and, secondly, the role of materiality in the negotiation of legitimacy with institutional actors.

5.2. Design with immediacy, workarounds, and matchmaking

RQ2: What forms of design are applied, and how do they support the reproduction of the space and its socio-material resources?

As a first approximation for articulating the forms of design I observed across the sites examined, Kohtala et al.’s (2020) table serves understanding of the continuum between use as-is and user innovation on seven distinct levels. For each of these levels, I can cite an example from the dissertation project: for use level, the appropriation of forms of funding (P4); for the level of objects, the repair or creation of clothes (P1); for the level of meaning, attending a repair event to socialise (P1); for local-settings level, a key-card system to allow all members entry to the space (P1); for collective level, the establishment of a monthly event day for building and socialising (P2 and P3); for the level of imaginaries, Trial & Error acting as a node for the foodsharing network to show that ‘expired’ food can be safely distributed and eaten (P4); and, finally, for platform level, the establishment of an umbrella organisation such as the OWA (P4). These examples support conceptualisations from prior design research that highlight everyday design (cf. Maestri and Wakkary 2011) and user design that enables ongoing practice (Redström 2008). Indeed, many of these actions take place as invisible work and practical achievements in day-to-day procedures (Bowker and Star 1999) and are engagements by ‘experts-in-the-everyday’ (Bieling et al. 2010).

While this wide array of examples helps demonstrate the existence of creative engagement at the sites beyond mere tinkering with objects, I wish to go further, discussing the three concepts I found to be the most crucial for understanding the reproduction of the DIY spaces: humble
design, infrastructuring, and workarounds. The notion of an everyday expert continues a line of thought wherein design has been historically regarded as utopian (cf. Dorrestijn and Verbeek 2013); I argue that the above-mentioned forms too have a utopian core, insofar as actors rearrange the socio-material status quo to align it with what they value more. Thus, in P2 we conceptualised the participants’ material engagement as a form of low-tech future-making. It had nothing to do with earlier modernist design visions for solving grand problems; rather, it was focused on working with what is at hand. Accordingly, we articulated it as humble design, a form of speculative design that is materialised speculation from everyday experts. This stands in stark contrast to most speculative-design formats, which I would describe as artificially set up (cf. Auger 2013; Broms et al. 2017), aligned well with existing formats for public participation outside the design realm – formats in which people are invited into a process that is already largely decided (cf. Papazu 2016). What I observed comes closer to the phenomenon Keinonen (2009) called immediate design, wherein laypersons adapt technologies for local, specific settings.

On another level, the rearrangement of material and meaning that I observed in multiple DIY practices over the years struck me as being visible also in the way many informants at the sites went about organising (see P1). Hence, infrastructuring appeared to be a useful lens for considering this work through design. While the emergence of further infrastructuring-focused studies of alternative communities does support such an argument (cf. Prost et al. 2019; Hirscher 2020a), the terms ‘infrastructure’ (Lee and Schmidt 2018) and ‘infrastructuring’ have recently attracted criticism for blurred definitions and expansive application. Accordingly, I wish to distinguish between two aspects of it that I have found useful, which might otherwise be conflated under the same umbrella term (as, admittedly, I did in P1). I do this next.

Infrastructuring is part of ongoing PD debate aimed at shifting the focus from the design of a specific product for a defined user group within a given project time frame to design as ongoing work over an extended time during which new uses and use cases might emerge (cf. Henderson and Kyng 1991). In efforts to address this concern, PD contributions, especially from Scandinavia (cf. Hillgren et al. 2011) and the US (cf. Le Dantec 2016), have often highlighted infrastructuring as a form of matchmaking
Discussing design as continuous repair with potential allies and new stakeholders. From a pragmatist standpoint, this approach has validity insofar as it is only through ongoing enquiry that we can understand the complex relations of actors in a given situation, so being open to engagement with emerging conflicts and synergies should be part of carrying the design process beyond what are currently rather narrow design briefs. While I have not undertaken any design intervention of this nature, I can state that the way in which Trial & Error (see P1 and P4) especially and the other sites examined in P4 remained active over the years is precisely by aligning their current resources (people, skills, space, and funding) with limitations (e.g., changes in rent) and opportunities (circular-economy discourse, the gap for a community centre, a volunteer programme, local administrators’ request for sustainability expertise, etc.).

However, as the example of a shelter structure that was purposefully left unfinished to invite others to complete it (P2 and P3) attests, opening projects for potential further use in the sense of infrastructuring is not self-evident. Whether other spaces might display similar dynamics is difficult to tell. Some spaces’ existence is rather brief, and for even those that endure it is difficult to study ongoing design over an extended span of time.

My third key concept draws on infrastructuring as what enables the completion of other people’s practices (Karasti 2018; Botero et al. 2019). To identify what this requires, I argue, we need a different level of granularity – namely, one at which limitations of the material setting are visible. For P4, therefore, we relied on Alter’s (2014) framework wherein workarounds are presented as shortcuts to material settings. A corresponding approach was taken, on several scales, at the sites observed. This is consistent also with Meyer’s work on DIY biology labs (2013), in which he identified workarounds to objects in transforming of items and workarounds to institutions in the labs’ creation of access to scientific equipment otherwise reserved to universities or businesses. Among the workarounds identified in my research are creating access to shared facilities outside opening hours through, for example, the above-mentioned design of a simple key-card system (P1), reopening a disused entrance to provide access (P4), exploiting forms of funding that were not obviously applicable to repair initiatives (P4), and adapting or creating designs for outdoor implementation (P2 and P3).

Especially, the study presented in P4 was helpful for underscoring how
Citizens

Neighbourhood
Resources:
- Material (e.g. Trash)
- Volunteers

DIY Citizen Initiative
Roles:
- Machine Care
- Internal Care
- Documenting
- Networking
- Treasurer
- PR

Resources:
- Everyday Items (e.g. Cargo Bikes)
- Local Knowledge
- Environmental Knowledge
- Authenticity
- Flexible Organisation

Umbrella Organisation (OWA)
Resources:
- Insurance
- Tools
- Legitimacy
- Organisational Blueprints

Local Administration + Intermediaries (QM)
Resources:
- Funding
- Space
- Navigating Bureaucracy
- Legitimacy

Next Iterations

Institutional Arrangements

Figure 2: Forms of generative repair (image from Hector and Botero 2021)
both workarounds and infrastructuring of new use cases and alliances helped the spaces secure the necessary resources (which, we found useful to group into the two categories discussed above: explicit ones, such as space, equipment, and volunteers, and implicit ones, such as third-party insurance, organisation blueprints, good relations with administrative officers, and resulting knowledge of how to navigate the surrounding bureaucracy) (See Figure 2 below). I found the study crucial to my general understanding too, as it highlighted the importance of resources and relations, which became evident only through following a particular site in the longer term. Furthermore, it emphasised that in contrast to how I had initially read the notion of circulatory power (Foucault 2009 as discussed by Schlosberg and Coles 2016) resources do not simply circulate; they might change themselves along the way, and most likely their surroundings too. I turn to this important phenomenon next.

Exploring these understandings of resource flows and addressing statements about how design often manifests itself as a form of ongoing trial of existing designs and adaptation of them into new shapes, in P4 we discuss design as a form of generative repair. The notion of repair is important beyond aspects of socio-material maintenance, so much so that I found a fundamental parallel between design and DIY. With the object of design having shifted to include alignment of existing practices (Botero and Hyysalo 2013) and, vice versa, with citizens having become accepted as design authors in everyday life (Kohtala et al. 2020), ‘repair’ seems a much more apt term to describe the inherent processes of design than we might think at first glance. Indeed, especially when regarding collective DIY efforts and how they try to align inconsistencies between their everyday routines of life (De Certeau 1984), the uneven allocation of expertise among practitioners (Kohtala et al. 2020), and the inherently utopian designs they produce for a better world in the here and now (Dorrestijn and Verbeek 2013), I regard this as design as continuous repair. The notion is even more valuable in that both the existing practices and technological advances are continuously evolving and often present local adaptations or hybrids rather than new-to-the-world designs (as Section 5.1 emphasises).

To clarify the relationship between the notions of generative repair and continuous repair introduced above, I used the former term in P4 to highlight that repair does not have to equate to restoration; rather, it can
Discussing design as continuous repair

bring forth new understandings or relations. In this positioning, the view
of design runs counter to prevailing understandings (wherein it is some-
thing heroically new, created out of thin air and isolated from the history
and situatedness of its materials); however, I took the notion further. I
developed it into that of continuous repair, in awareness that repair can
still involve restoration and in that the focus of the doctoral project was on
long-term design engagement of actors. I find this concept more in line
with my observation that our built environment and the socio-material
infrastructure connected to it are never quite ready. They truly are in con-
stant beta mode and the notion of continuous repair articulates this well
without any normative declaration that new understandings must arise.

To demarcate continuous repair further, I can point to the etymological
roots of the word ‘repair’, which go back to the Latin *reparare* (see the
Merriam-Webster definition), to prepare again. There are several reasons
behind choosing the word ‘repair’ over, for instance, ‘remaking’ or ‘repurpos-
ing’. Firstly, remaking arguably refers to the renewal of something that was
not necessarily broken or problematic in any way. Repurposing, in turn,
first and foremost describes something remaining untouched while getting
used in a different context. In this connection, I find ‘repair’ suitable as an
umbrella term that encompasses both of these specific forms; for instance,
it can cover repurposing since one could characterise the latter as repairing
the object–consumer relation and the consumer’s understanding of waste.
While there are several meanings of repair, they tie in with a practice that
everyone has engaged in and of which we all have some sense. What is
more, people usually understand repair as the opposite of design. Hence,
combining the two terms produces a much stronger statement than it
otherwise might.

In itself, the notion of repair in design studies to describe the shaping of
ongoing relations is nothing new (cf. Mikalsen et al. 2018 on infrastruc-
turing as ambiguous repair), and indeed both the productionist and the
solutionist side of design highlight an ethos of fixing. Moreover, in our
time of socio-ecological crisis, the demand to fix problems is certainly not
diminishing. What the notion of continuous repair adds to the table here
is a spotlight on socio-material arrangements as gradually changing via
each instance of encountering limitations and subsequent intervention,
but it emphasises just as well the necessity of further, situated intervention
Discussing design as continuous repair thereafter (Burckhardt 2012 [1980]). Secondly, it highlights the frequently unnoticed work of non-professional designers and their creative input. In doing so, it values those who make things work, instead of applauding only those who claim to create novel solutions. Thirdly and finally, it opens possibilities for seeing participation in ongoing design as a means to negotiate the shape of our socio-material infrastructure not only with members of the community but also with existing institutions (Huybrechts et al. 2017). Therefore, the final section of the chapter expands on how material artefacts could serve such negotiations.

5.3. Individual-level learning, collective negotiation, and institutional legitimacy

*RQ3: How do socio-material resources affect the negotiation of relevance and expertise at the level of individuals, the collective, and institutions?*

Despite my focus on shared spaces and collective practices, all of the sites I followed presented examples of participants who were keen on making something on their own. The interviews about the spaces examined in P1 and P4 and the long-term observations of Test Site for P2 and P3 highlighted that for some people material engagement in and of itself was the main driver for participation and satisfied their desires to create personal items, learn skills, etc., and this is consistent with traditional understandings of DIY (Atkinson 2006). At the same time, many interviewees for P1 reported growing curiosity as to how things work. On another note, increasing identification with the overall collective shaping of the sites was visible, especially in people at Test Site (in the studies for P2 and P3) and among some site organisers interviewed for P4. Clearly, therefore, people participate for a multitude of reasons. Nonetheless, the participation of those highly involved (see Section 5.1) featured heightened curiosity about the socio-material environment and processes of democratic decision-making or negotiation of values. This finding is fundamentally different from currently developing schemes that stress participation for participation’s sake, wherein administrative entities ask citizens to take part in processes that have already been entirely set in stone or at least narrowed to only
a few options (Kelty 2017). At the same time, while my findings point to a changing understanding of, for example, production, consumption, and human-to-human and human-to-material relations, it is difficult to pinpoint the emergence of new subjectivities across sites and participants.

Regarding claims of sustainable materialist communities and DIY as a form of social movement (e.g., Schlosberg and Coles 2016; Beveridge and Koch 2019), I have delved into the patterns in shapes and interactions across the sites to ascertain the appropriate terminology. While I have been referring to communities (alongside their spaces) and collectives fairly interchangeably, the term ‘collective’ is more prominent – in the section headings, for instance. Communities are understood as having shared values and practices (Anderson 1991), which certainly is true of the sites I studied, but I found that the term does neither do justice to their emergent character nor the material and situated aspects. Therefore, P1 referred to DIY spaces, thus highlighting the importance of the location and its situated dynamics. In hindsight, this term appears to cast the human relations into the background. In comparison, the STS-derived notion of collectives (Latour 2004) comes closer to appreciation for emergent human–material assemblages. However, it can also refer to a close-knit form of solidarity organisation. In the project’s most recent paper (P4), I refer to DIY initiatives, to underscore the will to practise something, collectively. While it suits discussions of will and participation, one could argue that this term is evocative of an event-oriented character rather than something with location. In contrast, when analysing existing terms, I found it curious that all of them used explicitly spatial ones, such as ‘space’, ‘lab’, ‘kitchen’, ‘café’, ‘library’, and ‘garden’ (see Table 1). Ultimately, the term ‘DIY space’ might be the best in general.

My recommendation to call the sites DIY spaces emphasises that not all of the people involved see themselves as activists as the term ‘sustainable material activists’ (Schlosberg and Cole 2016) or ‘material activist communities’ (Berglund and Kohtala 2021) suggest; that the practices take place in a dedicated space, which ‘collective alternative everyday practices’ (Deflorian 2020) fails to suggest; and that a space of this sort is not per se open, unlike the connotations of ‘open workshops’ (Simons et al. 2016) suggest. Taking inspiration both from attempts to map collective DIY (see the discussion in Subsection 2.1.2) and from recognition of tensions
in design research (Keinonen 2009), I group spaces for collective DIY on the basis of four tensions displayed, related to the questions ‘why?’, ‘what?’, ‘where?’ and ‘how?’ – related to participation (why?), speculation (what?), location (where?), and organisation (how?).

Why?

<table>
<thead>
<tr>
<th>Participation based on local needs</th>
<th>Staged participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.g. open workshop</td>
<td>E.g. urban-living lab</td>
</tr>
</tbody>
</table>

What?

<table>
<thead>
<tr>
<th>Immediate, appropriative speculation</th>
<th>Remote, techno-centric speculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.g. bike kitchen</td>
<td>E.g. most maker spaces</td>
</tr>
</tbody>
</table>

Where?

<table>
<thead>
<tr>
<th>Steady location</th>
<th>Mobile location</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.g. open tech lab</td>
<td>E.g. repair café</td>
</tr>
</tbody>
</table>

How?

<table>
<thead>
<tr>
<th>Emergent form of governance</th>
<th>Charter-based governance</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.g. hack lab</td>
<td>E.g. most fab labs</td>
</tr>
</tbody>
</table>

**Figure 3: Tensions in DIY spaces**

Proceeding from the reasoning above, I distinguish DIY spaces from similar collective-oriented experimental sites by virtue of the following definition:

*Citizens who come together because of local needs to engage in material, immediate forms of future-making beyond a techno-centric utopia that take place in a physical location, with activities that are organised on the basis of an emergent form of collective governance.*

Zooming further out to the level of social movements, I argue that cer-
certainly the sites I examined tie in with a larger interest in engaging with the material world, how things are made, and how resource flows might be shaped differently (Schlosberg and Coles 2016). However, I do not regard these sites as part of specific movements such as the right-to-repair movement (cf. Graziano and Trogal 2017), as the sites studied do not form a coherent whole with collective claims (cf. Hielscher and Smith 2014, p. 37 ff). The sites in Finland and one of the German ones are components neither of a larger repair network (e.g., repair cafés) nor of any other institutionalising making-based network (e.g., fab labs). Conversely, although the sites examined in P4 were part of the OWA (with one being a fab lab in addition), thus accounting for more than 200 workshops and hence more closely approaching a movement, referring merely to a national network would be more appropriate. The most suitable characterisation of this initiative–movement relation is that some DIY spaces receive greater coverage and gain more interest through propagation of a right-to-repair and related discourses, institutional legitimisation of similar practices (such as urban gardening), and/or the existence of umbrella organisations such as Germany’s OWA. While there is then no clear DIY movement, we can describe DIY spaces as part of a larger movement that includes initiatives trying to redesign resource flows in specific, local settings (Schlosberg and Coles 2016), some of which inspire or even support each other.

While subsuming the collective production of energy, food, and everyday items under the notion of a sustainable materialism movement certainly creates a risk of losing sight of some situated dynamics, by the same token Schlosberg and Coles (2016) arguably increase the sites’ legitimacy. As elements of a larger pattern, these sites appear stronger than they would if existing purely as individual islets. I argue that a similar influence comes from some of the local actors’ exchange with parallel initiatives, which echoes Light and Miskelly’s (2019) study of make-and-share initiatives, in which actors with commonalities mesh – i.e., they build relational capacities among themselves. Displaying such meshing, participants from P4’s four sites reported close interactions with ‘bottom-up’ initiatives in the city, including grassroots actors utilising abandoned buildings, supporting refugees, engaging in circular-economy pilot efforts, or running swap shops or tool libraries. One example is Trial & Error acting as a local node or fridge in the distributed foodsharing network, which saves discarded
Discussing design as continuous repair but edible supermarket food and stores it for the public. Additionally, I see the OWA (P4) as an institutionalised form of building alliances for increased legitimacy.

Because of such meshing and considering the increased spatial presence, we could depict this as part of a renewed ‘right-to-the-city’ struggle (Iveson 2013). However, my empirics offer only meagre evidence for any confrontation-type challenge to authorities; rather, they showed a mixture between co-operation and interference. Beveridge and Koch (2019) have suggested an alternative explanation: rather than claiming space to challenge authorities, DIY initiatives politicise everyday practices to create new subjectivities. As I argued earlier on, some core practitioners with the research sites certainly did negotiate either collective governance principles or what public infrastructure the administrations should provide, but these observations do not generalise to most people participating in DIY initiatives. Rather than toting up my observations as expressing a fight for a right to the city or development of new subjectivities, I regard these sites as meaningful engagements for people, in connection with which they can negotiate with others and, at times, even with institutional entities. Among the matters subject to negotiation are what sustainability means in lived reality, its social organising principles, and its socio-material infrastructure.

In line with STS conceptions of expertise, such negotiations rely on both demonstrations and audiences (Rip 2003; Barry 1999). In some instances I witnessed (e.g., in the work for P1 and P2), the audience consisted of the person doing something or a small group demonstrating the ability to do it, to turn a thought – however modest that utopia might be – into reality. This material demonstration could then enrol further actors, as the enactment of Test Site as a whole demonstrates (P2 and P3), and be further negotiated, or it might fail to do so, as in the case of the unfinished shelter at Test Site or the rebirth of Temporary as Kuusi Palaa. On other occasions I witnessed (e.g., P3 and P4), the audience consisted of various members negotiating information-sharing, meeting routines, and responsibilities with each other, or setting up an initial trial, carrying out tests, and then remaking accordingly. In still other situations, the negotiation’s audience might include a host university – for instance, examining what constitutes sustainability education and which location is suitable for it (P2 and P3) – or local administrative officers considering what sorts of events could be
staged, which rules to interpret (in which ways) for the context at hand, or how to use space and thereby provide infrastructure (P4).

The role of material output in such negotiations, then, is one of mediation and making different understandings concrete, analogous to how prototypes confront by demonstrating what might otherwise be veiled in theoretical abstraction (Sanders and Stappers 2014; Agid 2016). As we argued in P3, when different actors engage in experiments, it is important to understand that they may have separate, perhaps even opposing motivations. Consequently, I still see the importance of such material demonstrations as a direct consequence of neoliberal logics in, for example, university or public-sector organising, which expects measurable output against predefined milestones (cf. Harvey 1989). However, it is more than that: in the work for P3, it became clear that the material outcomes of the negotiation were highly important to the participants in the Test Site space, especially for counterbalancing an experiment, which was open-ended time-wise, ongoing negotiation of multiple use cases purpose-wise, and modality-wise an egalitarian endeavour to honour everyone’s voice. On a similar note, the artefacts provided by the OWA (promotion videos, organisation blueprints, reports collected from its member sites, etc.), while helping support the legitimacy of the sites and articulating their concerns to administrative actors and funders, equally created a commitment factor for those creating the content. The latter function, I argue, echoes traditional understandings of satisfaction via DIY (cf. Hirscher 2020b). In consequence, I maintain that it is crucial to see material culture as multivalent (Marres 2012; Nold 2017).

Finally, I found that the form of negotiation comprises both strategic elements and tactical elements (De Certeau 1984), with the relations of the two to each other being rather reminiscent of what Sara et al. (2020) have described as manoeuvres. This back-and-forth iteration that depends on what the situation requires is in itself also consistent with Dewey’s take on learning enquiry (Dewey in Miettinen et al. 2012). Citing examples of strategic elements, interviewees for P4 described co-operation with institutions of high culture, the city administration, or local economic production structures and how the DIY space could deliver relevant work to them. In other cases, as with the use of vacant space for a change of location or adaptation of Trial & Error’s purpose to neighbourhood needs (P4), they expressed tactical will to exploit cracks in the order of resources
Discussing design as continuous repair flows. Likewise, many of the workarounds discussed above, in Subsection 5.1.2, are in my eyes part and parcel of tactical elements.

In line with Telin et al.’s (2020) suggestion, the continuum from tactical to strategic space features good relations to officials as well, aimed at employing tactical action and workarounds within the respective institution, as evidenced by how funding forms can be appropriated (see P4 and also P3’s discussion of the funding backbone for Test Site). These are, then, challenges to institutional frames in a less radical way; they are directed toward aligning and rearranging worldviews within institutions before they can break down upon confrontation with other worldviews (cf. Star and Ruhleder 1994; Hillgren 2016). The missing exchange on differences in worldviews and organisational culture, arising in part from time constraints, was highlighted by a key informant cited in P4 and, though less explicitly, played a role in P3’s context. The forms of negotiation presented above are also the reason I have not relied much on concepts such as autonomia (Escobar 2018). Such perspectives may aid in considering practices’ relations to their environments – e.g., what resources are important to a collective – but in the case of DIY spaces I find that they would obscure the far more nuanced relations they form with their surroundings.

5.4. The contributions in summary

1. DIY spaces consist of citizens coming together because of local needs to engage in material, immediate forms of future-making beyond techno-centric utopias, with the activities taking place in a physical location that may also incorporate event formats, where the organisation is based on an emergent form of collective governance.

2. The doctoral research articulated the nature of DIY spaces as emergent and relational infrastructure for diverse use cases related to ‘make, test, and repair’ practices. These include providing access to workshop equipment and knowledgeable everyday experts; functioning as a social meeting place; and, for invested practitioners (the organisers), supplying ways to materially act out utopian ideas. Realising the latter visions includes both adaptation of existing products to local settings but equally ways of
collectively organising, which encompass the choice of decision-making tools, evolution of responsibilities, and development of the overall purpose. Albeit far from radical (being, in fact, quite reliant on what is at hand), the material engagement is nonetheless a demonstration that things might be otherwise. In this there is a resemblance to a mode of ongoing, immediate future-making.

3. It is crucial to understand that different intensities of participation exist across and within the spaces. This entails prefiguration when invested participants devote significant time and effort to the endeavour, and consequently some of them appear to develop new subjectivities. At the same time, it also entails refiguration insofar as some participants are at the site for only a short while, in which time they engage in alternative forms of consumption and production but then return to their normal mode of everyday life.

4. Therefore, material demonstrations not only matter as part of the immediate future-making but, further, help actors commit more fully, and thus they stabilise experimental sites that are multiple-use, egalitarian, and (in the time domain) open-ended. In this regard, the sites appear to be in constant beta mode, thereby mirroring at organisational level the ethos inherent to DIY at the level of individual practitioners.

5. Consequently, this research highlights the inventive work of invested actors as everyday design that resembles ongoing or continuous repair. On product level, the interventions often appear as adjustment to local settings, and something similar can be said of a wide range of organising responsibilities that require maintenance and repair. More specifically, to enable others to engage in DIY practices, organisers need to apply workarounds, which entails repurposing material settings: spaces, objects, official forms, etc. In addition, to sustain the site and open it to further uses, organisers operate in infrastructuring alliances; i.e., they align their emerging needs and opportunities with institutional actors. These repairs are not fixes in the sense of something static, however, but ongoing and sometimes generative forms that, in turn, influence the overall sites.
6. Simultaneously, officials in institutions themselves engage in workarounds as a part of informal institutional work, thereby underscoring that institutions too are sites of active change. What is more, while DIY spaces and institutions may, to some extent, follow different – even opposing – ideas of what urban space ought to be, they are caught up in much more intricate relations than the terms ‘bottom-up’ and ‘top-down’ suggest. Accordingly, DIY spaces can benefit from manoeuvring between tactics and strategies.

7. That negotiation, I argue, demands that the sites demonstrate relevance to institutional actors; they must present themselves as valuable everyday experts. Thus, they become legitimate recipients of resources from institutional or intermediary actors, such as space, tools, and bureaucratic knowledge, while demonstrating and making available their local expertise and network. After all, some of the sites collaborate with neighbouring/similar initiatives, thereby creating further relational capacities and increasing their local relevance and legitimacy. In a similar manner, some of the sites in Germany exhibited ‘gentle’ formalisation through the establishment of an intermediary institution (the OWA, which creates links via the insurance, organisation blueprints, and other relevant tools it gives its members). In this regard, the socio-material resources and material demonstrations produced by the sites are a crucial element of the negotiation of expertise.
6. Conclusions

The final chapter integrates the insights presented in the discussion and summarises the implications of the doctoral research. One key objective is to bring out insights with relevance for actors involved in a ‘make, test, repair’ culture, especially with regard to interactions between those in DIY citizen spaces and institutional actors. The findings have implications also for design education at large, so, secondly, I address how the design profession and, specifically, the design process we teach to design students can take inspiration from discussion of socio-ecological change processes generally and repair culture in particular. Finally, Section 5.3 discusses the limitations of my work, as a stepping-stone to possible avenues for future research.

6.1. Implications for actors involved in a ‘make, test, repair’ culture

I have recommended regarding collectives that aim to build free infrastructure for a ‘make, test, and repair’ culture as relevant actors in the negotiation of sustainability in lived reality. Accordingly, the stance I have taken here emphasises the socio-materiality of practices and infrastructure on the various sites examined. While the seven sites I followed in the four years of study demonstrated situated dynamics, I conclude that, by and large,
they positioned themselves as experiments in creating different resource flows and the underlying collective organising modalities. Such a frame emphasises the social aspect of the sites and their emergent nature, thus further challenging existing narratives of maker sites as the locus of economic growth through individuals’ merits (cf. Turner 2018). Indeed, the sites observed currently appear economically irrelevant. Rather, most of them reflect the form of a community centre, open for and connected to a wide range of projects, that provides value that should be communicated strongly to policy-makers.

Accordingly, many use cases and potential users appear, from one-time visitors with rather pragmatic needs for space, tools, or knowledge to regulars who enjoy sharing the above-mentioned resources to people who engage in more complex hobby projects that might develop into further public infrastructure themselves. Understanding such distributed expertise and intensity of participation is key to understanding the dynamics of such sites. They oscillate between participation as ‘refiguration’ (i.e., short-term ‘retrieval’ of an idealised and responsible consumer-self while one is participating in an event; see Deflorian 2020) and participation as ‘prefiguration’ (i.e., regular practitioners’ strivings to actualise utopian ideals with regard, for instance, to free public infrastructure, including means of collective governance of this; see Yates 2015). This entails an ongoing process of negotiating meeting routines, ethical data-sharing, and how the responsibilities necessitated by a shared space can be arranged other than via person-bound responsibilities. For all practitioners, I would recommend building on the strategies for decentralised organisation already employed by collectives such as Ensprial (Cabraal and Basterfield 2019).

The sites’ emergent and open character, reflected in their very names – ‘Open Workshop Association’, ‘Test Site’, ‘Trial & Error’, ‘Temporary’, etc. – induced several ambiguous consequences. Firstly, the will to be open to all is materialised not through names or statements but through the everyday practices of the collective. In this regard, while the rather low-tech nature of the projects and tools simplified the interaction for newcomers, the often-mixed purpose and emergent modalities of the sites appeared discouraging to the extent that they lead to self-selection of participants. At the same time, however, the will to embrace other people and initiatives serves to build momentum and at times greater legitimacy. Some of the
sites seemed to stay in close contact with similar undertakings, such as libraries of things or circular-economy initiatives; thereby, as a whole, they resemble meshing, or relational building of local capacities. Balancing this ambiguity appears key to me, and I suggest that being more honest about the notion of an open space would be helpful.

While such local distinctions make it difficult to speak of a DIY movement, the sites observed mirror a larger trend of sustainable materialism, in which initiatives try to reorganise resource flows (Schlosberg and Coles 2016). I found that the establishment of the OWA as an umbrella institution and intermediary for initiatives in Germany stressed the strategic will to support similar initiatives and make available relevant resources such as third-party insurance and organisation blueprints. However, different to, for example, fab labs or repair cafés, this form of institutionalisation purposefully refrained from predefined governance principles or branding requirements, thus again leaving space for the sites’ ongoing negotiation and for shaping in accordance with local settings.

Viewed ‘from above’, to some extent most of the sites engaged in negotiating legitimacy with authorities or institutional actors. This entailed roles of intermediaries, whether formalised ones such as the OWA (P4) or individuals acting *ad hoc* (P2 and P3; cf. Stewart and Hyysalo 2008). Accordingly, at all sites, space was a prerequisite for any ‘make, test, and repair’ activities, and finding a space or rental arrangement required significant creative effort. This issue highlighted the need to debate which public infrastructures are crucial for socio-ecological change. In similar fashion to the space, obtaining tools, materials, and bureaucratic knowledge demanded processes of workarounds and alliance-building carried out by invested practitioners. This phenomenon highlighted a form of DIY ethos exhibited in the organising modalities. Equally important were the administrative officers’ workarounds and alliance-building, which point to institutions as sites of ongoing change (Huybrechts et al. 2017). In sum, an ability to find the relevant resources required the sites to manoeuvre by switching between tactical interference in the ordered flow of resources and strategic alliances with more legitimate actors. This is one reason I posit that the prevailing dichotomy between tactical bottom-up initiatives and strategic, top-down institutions is not useful in the present context. Actors should explicitly discuss what assists with their interaction, such
Conclusions

Finally, through a focus on the socio-material aspects of practices and their enabling infrastructure, the dissertation project pinpointed the multi-layered role of materiality amidst these negotiations. I argue that, for those who participate actively in the shaping of collectives, practical projects and material demonstrations (such as presentations, manifestos, and useful products) served as an anchor for commitment in what are otherwise highly emergent structures. At the same time, these artefacts were intimately linked to how initiatives can claim relevance when engaging in experiments with institutional actors.

6.2. Implications for design research and education

This study came about following my interest in ‘make, test, and repair’ culture and, at a more abstract level, in forms of design related to imagining different resource flows and shaping corresponding infrastructure. My study contributes to more nuanced understandings of design instead of perpetuating a perspective from which professionals create quick fixes for society-scale problems (Kimbell 2011). While we can observe a design(er) interest in discussing futures, including how to develop different visions and consequent pathways to realising those visions, speculative-design researchers have tended to highlight designers’ apparent capacities to raise issues and new questions (Broms et al. 2017). My understanding of practices as routinised, material engagement led me to question the efficacy of such an approach. Alternatively, I suggest, our surroundings already provide plentiful visions of the future. Understanding them as ongoing, materially mediated negotiations of how people want to live can cultivate fertile ground for design-research engagements, alongside settings with only predetermined lists of stakeholders and invitations to domain-specific experts.

Furthermore, it is important to look beyond design as idea-driven visioning process, because such a perspective risks losing sight of how people get design done (Botero et al. 2020). After all, it is part and parcel of design that, when limitations and obstacles appear, the given order requires rear-
rangement if something is to appear that better suits all the actors involved. Therefore, the second guiding theme for my research was the everyday creativity of those who are invested in the organisation of ‘make and repair’ sites, internal and externally facing, and concluded in the notion of design as continuous repair, to draw attention to the ongoing rearrangement of material stuff, relations, and meaning.

Firstly, there is a growing body of literature on the continuum of user-design engagements (cf. Kohtala et al. 2020; Hirscher 2020b), which justifiably highlights the creative work that non-professionals do as experts in the everyday when facing obstacles. In this connection, I wish to stress the notion of workarounds in particular (Alter 2014), which to my mind is useful for extending design to the realm of material shortcuts, especially in work focused on collective organising. What such a perspective entails at base is to consider the often-invisible maintenance and repair work(ers) as crucial collaborative players and hence worthy of appreciation.

Secondly, my attention to infrastructuring as building of alliances (at, for instance, alternative consumption sites; see Seravalli et al. 2017) underlines the emergent character of a design space (cf. Botero 2013), in which diverse actors engage in an ongoing process of problem definition, alignment of worldviews, and making available resources to deal with emerging requirements and needs. This perspective clarifies the need for design to address increasingly ambiguous problem settings, in which different expectations and needs emerge over time and must be reconciled (Redström 2017). Here, understanding the relation-building and alignment of the actors in question and being aware of how it affects the overall collaboration sought requires attention.

Finally, I suggest that these conceptions bear consideration for enrichment of design-process models in design education, especially in times of increased socio-ecological crisis. Rather than start by creating attractive but remote concepts, some of which may require resource inputs that are immense for often short life cycles, it would be worthwhile to turn the process partly on its head. I recommend striving to be more attentive to what resources, skills, and knowledge the specific local setting and situation can supply. Through this, we would ground designs strongly in local dynamics and pay tribute to existing efforts, rather than try to create everything from scratch as is often done under a productionist conception of design.
Secondly, the design process would benefit from a better understanding of design unfolding over a longer time and, hence, could improve its catering to emerging needs and relations. In this regard and from a socio-material angle, artefacts do not function purely as parts of higher-order systems, as with a phone providing a portion of the functionality of a sharing platform. They also help us understand actors’ diverse expectations and how alliances take shape. I side with Huybrechts et al. (2017) in that focusing on micro-scale politics in the city can be counterproductive to repoliticising design. We need to look at the alliances that inhibit or support the design of such entities as free-to-use infrastructure for a ‘make, test, and repair’ culture.

6.3. Limitations and future research avenues

I must emphasise that I regard the reoccurring patterns across the seven sites not as proof of generalisable knowledge but, rather, as a mosaic of situated findings, which can help us better understand the phenomenon of DIY spaces or collectives. Clearly, by virtue of active selection of the sites to follow, the sites showed many commonalities. However, they all were situated in specific local settings and relations so differed in some respects, with such specifics having clear consequences for the possible use cases and dynamics of participation. Still, with the exception of Test Site and its modality as newly created and student-run, these were relatively similar settings.

Location wise, this study is moreover specific due to its focus on sites in Finland and Germany. While the settings I encountered might overlap with those in other countries, they certainly featured culture-specific advantages and limitations. In Finland, both DIY culture and communal infrastructure display strong roots (the centrality of remaining in touch with rural-cabin life and the uniquely important role and extended function of libraries are classic examples). In contrast, cultural activities and events there are highly regulated. Hence, it is interesting to observe that most practitioners at the sites I observed in Finland were expatriates. From conversations, I can only speculate that expatriates might experience a more urgent need
for social infrastructure and might demonstrate a will to experiment with
given culture-conditioned procedures simply because they know that things
could be otherwise.

In Germany, in comparison, while popular belief holds that some for-
merly poor regions in the south-west have a disposition to tinkering, there
is not such a strong cultural heritage of DIY in that country, by and large.
Again, I can only speculate, but the much earlier industrialisation and ur-
banisation there might lie behind this. Furthermore, the establishment of
the OWA and the provision of third-party insurance expresses nation-spe-
cific leanings, with positive implications. There are some similarities to
Finland, though, such as the culturally highly regulated procedures related
to how things ‘ought to be’, especially in public. The German sites too pro-
duced several stories of expatriate participants looking for ways to engage
locally in contrast against given procedures. In this regard, the Berlin re-

gion, in the vicinity of which many of the research sites were clustered, has
been an epicentre of alternative, needs-based consumption and production
schemes. In this it is set strongly apart from most other parts of Germany.

Apart from the possibility to examine settings in other countries and
cultural environments, I want to draw attention to several other research
paths connected with this project that I could not examine closely but
appear worthy of attention. Firstly, the proliferation of sites of the type I
studied goes hand in hand not only with a democratisation of physical
and digital tools but also with a changing cultural understanding of re-
use. This is visible also in resignification and professionalisation of both
second-hand shops and recycling depots, in both of which Finland seems
to me to be pioneering. I expect recycling depots to become an essen-
tial part of public infrastructure and should be planned in line with the
mixed-participation activities I have observed. Therefore, understanding
how to make recycling depots accessible with regard to their spatial design,
their use cases, and ways to participate in the overall organising of the sites
would be worthwhile. As for refigurative and prefigurative participation,
these settings would also provide a context for further examination of the
effects of event-based reuse activities on individuals’ consumption relative
to more stable settings’ influence.

Secondly, the idea of a good life for all – i.e., being able to satisfy material
and social needs while not exceeding the planet’s limits (O’Neill et al. 2018)
Conclusions

– is receiving increased attention in debate surrounding socio-ecological change. I find the notion of ‘good lives’ even better for emphasising that for different people there are and indeed must be different understandings of what a good life is. The sites I studied made several implicit and even explicit references to exploring good lives through ideas such as public infrastructure, intrinsically motivating activities such as tinkering or volunteering, time wealth, and – most importantly – different conceptions of work. Understanding how some of the more established sites might present fertile soil for a post-growth definition of work would be another avenue to consider.

Also, considering sites where people engage with a ‘make, test, and repair’ culture might help us better tackle debates that often present a degrowth vs. eco-modernity dichotomy. Degrowth suggests a planned reduction of resource consumption in the Global North to realign with the planet’s boundaries, accompanied by more just access to the necessary resources globally. Eco-modernity, in contrast, is an argument for technological advancement. With regard to the former, negotiating collective means of governance or the above-mentioned conceptions of good lives (among them time wealth and volunteer work) highlights some of the crucial contributions that degrowth debates bring to the table. At the same time, some outcomes from the sites studied, be they on product level or in influencing administrative procedures, suggest that a focus on local, self-run production schemes alone will not suffice. Such endeavours have to be combined with large infrastructural change projects, as some proponents of eco-modernity argue. Consequently, I suggest further investigation of what some refer to as ‘radical incrementalism’ (Göpel 2016). This encompasses both pioneering the use of collectives and, through creation of alliances, mandating regulatory infrastructural change.

As a direct consequence of the above, understanding the multiple temporal scales present at sites such as those I observed can serve as a further useful lens for socio-ecological change agendas. To be more precise, the seemingly contradictory notions of patience and urgency are both made manifest when people want to demonstrate that things might be otherwise. On one hand, we see the urge to do something, and, on the other, patience is needed in working out the intricate details of getting it done, especially for doing so collectively. Understanding these dynamics’ consequences for
how people come together and rearrange things constitutes a promising avenue both for sustainability-related studies and for design research.

Fifth and finally, it would be worthwhile to follow up on my conclusions regarding immediate forms of future making. As I have argued not only do all forms of design exhibit some form of speculation but there are also plentiful, collaborative projects outside of professional design that demonstrate that things might be otherwise. Better understanding this wide array of practices, how they appropriate resources and what barriers they encounter will be highly informative to both sustainability transformations and a design education that needs to address this.
The finished/unfinished shelter. Source: Test Site
Reproduced with permission
Bibliography


Auger, James. 2013. ‘Speculative Design: Crafting the Speculation.’ Digital


Clarke, Alison J. 2016. ‘The New Design Ethnographers 1968–1974: To-


Diani, Mario, and Doug McAdam, eds. 2003. Social Movements and Net-

Dickel, Sascha, Jan-Peter Ferdinand, and Ulrich Petschow. 2014. ‘Shared Machine Shops As Real-Life Laboratories.’ *Journal of Peer Production* (Special Issue 5).


Foster, Ellen Kathleen. 2017. *Making Cultures: Politics of Inclusion, Acces-
Haenfler, Ross, Brett Johnson, and Ellis Jones. 2012. ‘Lifestyle Movements:


Inglehart, Ronald. 1997. Modernization and Postmodernization: Cultural, Eco-


Kelty, Christopher M. 2017. ‘Too Much Democracy in All the Wrong Places: Toward a Grammar of Participation.’ Current Anthropology


Lave, Rebecca. 2012. ‘Neoliberalism and the Production of Environmental Knowledge.’ Environment and Society 3 (1).


Maxigas. 2012. ‘Hacklabs and Hackerspaces: Tracing Two Genealogies.’
May, Tim, and Beth Perry. 2017. ‘Knowledge for Just Urban Sustainability.’ 
*Local Environment* 22 (January): 23–35.


McCrory, Gavin, Niko Schäpke, Johan Holmén, and John Holmberg. 2020. ‘Sustainability-Oriented Labs in Real-World Contexts: An Exploratory Review.’ *Journal of Cleaner Production* 277 (December), paper 123202.


Moss, Timothy. 2016. ‘Discarded Surrogates, Modified Traditions, Wel-


Shove, Elizabeth, Mika Pantzar, and Matt Watson. 2012. The Dynamics
of Social Practice: Everyday Life and How It Changes. Los Angeles, CA: SAGE.


Tonkiss, Fran. 2014. ‘From Austerity to Audacity: Make-Shift Urbanism and the Post-Crisis City.’ In Make_shift City: Renegotiating the Urban Commons, edited by Francesca Ferguson, 165–71. Berlin, Germany: JOVIS.


Wendler, Jana. 2014. Experimental Urbanism: Grassroots Alternatives As Spaces of Learning and Innovation in the City (doctoral dissertation). Manchester, UK: University of Manchester


Appendix A: The interview guides

The study presented in P1:
1. Informants’ views on the emergence, spatial quality, and organisation of the initiative
2. Informants’ views on motivations, skills, and material
3. Informants’ views on social interaction in workshop settings and the role of facilitator
4. Informants’ views on socio-ecological change, alongside what drives and limits it

Interviews conducted:
Interview (~75 minutes) with informant N from Dietenheim zieht an
Interview (~75 minutes) with informants O and G from Temporary
Interview (~75 minutes) with informant U from Trial & Error

The study presented in P2:
1. Informants’ views on the emergence and purpose of the site
2. Informants’ views on negotiations with the institution
3. Informants’ view of barriers to participation and realising utopian ideas

Interviews conducted:
Interview (~ 45 minutes) with Test Site’s informant NL
Interview (~ 45 minutes) with Test Site’s informant EY
The study presented in P3:
1. Informants’ views on the meaning and success of experimentation
2. Informants’ views on community-building, decision-making tools, and roles
3. Informants’ views on power distribution and participation
4. Informants’ views on utopianism in relation to the site

Interviews conducted:
Interview (~ 45 minutes) with Test Site’s informant IL
Interview (~ 45 minutes) with Test Site’s informant IO
Interview (~ 45 minutes) with Test Site’s informant D
Interview (~ 45 minutes) with Test Site’s informant IK
Interview (~ 45 minutes) with Test Site’s informant A
Interview (~ 45 minutes) with Test Site’s informant B
Interview (~ 45 minutes) with university informant IO2
Interview (~ 45 minutes) with university informant EI

The study presented in P4:
Guidelines for workshop operations’ organisers:
1. Informants’ views on the emergence of the workshop, its purposes, and visitors
2. Informants’ views on essential resources and networks
3. Informants’ views on the relations between workshop operations and external associations
4. Informants’ views on the workshop’s organisation, protocols, and the roles developed
5. Informants’ views on limitations and problems, both those overcome and persistent ones

Interviews conducted:
Interview (~ 60 minutes) with Trial & Error’s informant A
Interview (~60 minutes) with informant A from FabLab Cottbus
Interview (~80 minutes) with Hebewerk’s informant H
Interview (~75 minutes) with Konglomerat’s informant E
Guidelines for actors in local administration:
1. Informants’ views on resource flows from the local administration to civil society
2. Informants’ views on the meaning of civic initiatives proposed to the local administration
3. Informants’ views on advantages of and limitations to the exchange
4. Informants’ views on future improvements to the situation

Interviews conducted:
Interview (~ 30 minutes) with informant V
Interview (~ 30 minutes) with informant IA
Interview (~ 30 minutes) with informant IS

Guidelines for the Open Workshop Association:
1. Informants’ view on relations between the association, funding bodies, and workshops.
2. Informants’ view on resource flows between association and workshops.
3. Informants’ view on communication between association and workshops.
4. Informants’ view on similarities and distinctions between the workshops.
5. Informants’ view on global equivalents to the German OWA.

Interviews conducted:
2 interviews, of ~70 minutes each, with informant O

Appendix B: Additional research material

For Test Site:
Internal strategy documents (from a workshop on the site’s future
Slack-channel discussions
For Trial & Error:
4 leaflets on workshops’ themes

For the OWA:
Print magazine on repair initiatives (67 pages)
Print magazine on open workshops (27 pages)
Leaflet about the foundation ‘Anstiftung’ that is behind the OWA

For the local administration:
City-quarter map prepared for a fair and sustainable life
Campaign leaflet on increased quality of life in the quarter
Leaflet on the QM organisation, ‘Quartiersmanagement’
In recent years the phenomenon of citizen engagement at alternative production and consumption sites is proliferating. People experiment with making products or organising as a group, but by virtue of the 'stuff' they make, some also negotiate their sustainability concerns and expertise on material level. To better understand the individual, collective and institutional work behind this negotiation, the dissertation examines several DIY spaces – spaces that provide free access to tools and knowledge around a 'make, test and repair' culture.

By highlighting how the actors involved appropriate nearby resources, apply workarounds to overcome material limitations, and build alliances to match emerging needs and opportunities, the dissertation argues these to be forms of immediate design that resemble continuous repair. Consequently, this thesis suggests that contemporary participatory design can take inspiration from such citizen engagement, their focus on the resources at hand and the seemingly trivial work that goes into their rearrangement.