Jamming sustainable futures: Assessing the potential of design thinking with the case study of a sustainability jam

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Highlights
- Complex sustainability problems require changes in Design Thinking practice.
- User-orientation in Design Thinking is ill-equipped to address sustainability.
- Design Thinking’s personas and prototypes are insufficiently complex.
- Sustainability jams need to better foster social creativity and embodiment.
- Redesigned Sustainability Jams may contribute to changed social practice.

Abstract
This paper describes and analyses the potentials and limits of Design Thinking in Sustainability Jams, claimed increasingly to contribute sustainability solutions and changed practices for desired futures. With an in-depth case study, we show how the current application of “Design Thinking” coming from the management context (where Design Thinking is deployed as a human-centered problem-solving approach) can impair the idea of a Sustainability Jam and where this event format must be questioned. Design Thinking and Jamming are found to offer promising tools and frameworks to generate possibilities for sustainable futures, yet the case study demonstrates how this potential is squandered. Our empirical results point to several limitations in the practice of a sustainability jam: User-orientation, the use of personas and prototypes, insufficient complexity and insufficient embodiment hinder the potential of design thinking to foster social creativity and to address wicked problems of sustainability. We suggest directions in which to understand and eventually overcome these limitations, toward redesigning sustainability jams in order to better fulfil their promises.
Keywords
Design Thinking, social creativity, sustainability, sustainability jam, case study, qualitative complexity

1 - Introduction

“Design Thinking” (DT) has in recent years come increasingly under the scrutiny of sustainability researchers (Carlsson et al., 2014; Fischer, 2015; Maher et al., 2018), as a method and a format for workshops taken from the business field (which itself in turn had borrowed it from the field of design). Ahead of this growth in academic interest from the field of sustainability research, DT has been taken up increasingly by societal actors at the crossroads of civil society, economic practices and civic engagement for sustainable development. One of the specific DT events formats developed by these societal actors and disseminated in cities across the world, is the “Global Sustainability Jam”, which sets itself the goal to generate ideas for sustainability solutions.

Rather than repeat earlier researchers’ re-iterations of what design theory and DT discourses are prescribing or claiming, we will share here the results of an empirical observation and analysis of DT as it was concretely practiced in one local Sustainability Jam (SJ). This empirical research is worth doing because of the heavy use of DT as an approach in engagements for sustainable development. We want to know how grassroots practitioners for sustainability make use of DT: How far does DT, as it is implemented in the context of sustainability activism, far from its original context in design, fulfil the characteristics it has been praised for? What are the empirically observed potentials and pitfalls of the usage of a “classical” DT workshop format at a SJ, a format transferred from business for the specific goals of sustainability-seeking social actors? What do our observations imply for the concept of Design Thinking in a sustainability context?

These research questions compelled us to select one concrete case of a SJ, in order to analyse it. We needed to observe its processes in close detail, to find out more which potentials, which qualities and which limitations evidence themselves in the practice of DT in a sustainability context. Therefore, we proceed with a social-scientific qualitative empirical single case study, as the most suited methodological approach to allow in-depth insights into the qualitative micro-social processes at play in such a situation.
2 – Theoretical background: Harnessing Design Thinking for sustainable development

Both DT and jamming can be used as tools to achieve some output and as a framework to proceed. In combination they provide the opportunity to address wicked problems.

![Diagram of Design Thinking and Jamming for Desirable Futures](image)

**Figure 1: Design thinking and jamming for desirable futures**

### 2.1. Design Thinking: providing possibilities

Reviews of DT point out two traditions of usage of the term: DT as the analysis of design in Design Theory, and DT as a human-centred problem solving approach (Georgiev, 2012). Here, we focus on the latter, as it has become an increasingly popular approach in sustainability-related engagements.

As a tool, DT fosters creative thinking, while providing a means to structure it (Fischer, 2015, p. 175). As a framework, DT alternates between divergent and convergent thinking-processes and provides a specific way of abductive reasoning that enables designers to think beyond traditional solutions and find new and more creative ones (Buchanan, 1992). In particular, when neither “the problem”, nor “the solution” are fully known (or knowable), DT used as an abductive approach (Dorst, 2010) is suitable in order to uncover emergent responses to
problems: All we have is an “aspired value” (such as a “desirable future”), but we do not know for sure exactly “what” to create or which “working principle” to use in designing the aspired value. “Performing this complex creative feat of the creation of a thing (object, service, system) and its way of working in parallel is often seen as the core of design thinking” (Dorst, 2010, p. 133). Razzouk & Shute (2012) also name dissatisfaction and unmet needs as a driver of DT, which can be focused by a DT process via interaction and communication with the people whom it is designed for (Brown & Wyatt, 2010).

A core principle of DT is the integration of “users” at a very early stage (user-centric thinking). In the management context (Brown, 2009) DT has been developed as a process with three major stages: (1) inspiration, (2) ideation and (3) implementation (Brown & Wyatt, 2010). The inspiration stage starts with empathizing (who is the audience for whom you design?) and defining (what is the user’s point of view?). For this, a user has to be described (persona). The second stage, ideation, is all about the generation of ideas, creating solutions, and prototyping, building a visual manifestation of the idea (Ogilvie & Liedtka, 2011). This leads to a prototype. The third stage comprises testing (with user feedback) and implementing. The process is iterative rather than linear, including several loops or overlapping stages.

“Ideation” and the respective innovations sought after in DT are crucial elements towards the emergence of sustainable futures. Therefore, DT has become popular in recent years not only within business fields but also among sustainability-oriented managers as a method to explore possibilities and create alternatives.

2.2. Sustainability Jams: providing the particular setting

*Jam sessions* originate from jazz and are the “most characteristic occasion” (Cameron, 1954, p. 177) for playing jazz music. Individual and collective creativity have been reported to be especially well fostered through jam sessions in jazz and other arts forms, thanks to the qualities of their embodied and contextually embedded communicative processes of group improvisation (Sawyer, 2003). A jam session brings together different individuals who collaborate to create something that emerges from the dialogue between the participants. The dialogue as elaboration on a theme could be a vision-oriented design towards creating futures (Bratteteig & Stolterman, 1997). Eisenberg (1990) characterizes jamming as transcendent - being part of a larger whole, experiencing flow.
As a tool, jamming allows for training, developing creativity, and professional networking (Herzig & Baker, 2014, p. 185). As a framework it combines individual performance with collaboration on the basis of improvisation.

Key conditions are, according to Eisenberg (1990) and Carlsson et al. (2014): skills (participants are capable of contributing something of theoretical or practical relevance), structure (participants agree on certain rules to direct creativity towards challenges), setting (participants meet outside their accustomed environment), surrender of control (participants feel free to engage), and choosing a relevant (“hot”) topic.

“Jamming” has been applied to for example technology development (Overkamp & Holmlid, 2015), group design (Bratteteig & Stolterman, 1997), and addressing sustainability challenges (Carlsson et al., 2014).

With regard to sustainability-related issues, a specific DT-based format of SJ is considered by some researchers (e.g. Carlsson et al., 2014) as an opportunity for jam participants to become part of the search for solutions-oriented approaches to wicked problems (Rittel and Webber, 1973; Brown and Wyatt, 2010) of sustainability.

SJs are DT-based workshop-like events that aim to mobilize creativity for sustainability. The “Global Sustainability Jam” takes place once a year, in different parts of the world with local jams at 25 locations on the same weekend (John, 2017). People interested in sustainability and creativity meet for “48 hours to save the world” (http://planet.globalsustainabilityjam.org). Based on the principles of DT, these jams aim to generate and reflect on innovative ideas for sustainability, to consider their applicability, and to stimulate their implementation. As a “multi-actor approach”, participants represent a variety of perspectives in an “arena for out-of-the-box thinking” (Carlsson et al., 2014, p. 31).

Arranging six SJs at the 2012 Greening of Industry Network Conference, Carlsson et al. (2014) investigated the outcomes and limitations of these SJs. Because of time constraints during the conference, the jams were focused on relatively narrow challenges for the six companies. Yet, these authors concluded that SJs provide an arena outside the routine to address collectively a “hot topic”.

Preliminary to exploring the suitability of DT within the setting of SJ for sustainability-related questions, we now address sustainability.

2.3. Sustainability: the procedural understanding
The procedural understanding of sustainability focuses on desirable futures as they emerge from social interactions (Miller, 2011, p. 31). This understanding enables a dynamically adaptive, context-sensitive, system-oriented and complexity-driven view of sustainability, with sustainability seen as an ongoing change process rather than a definable concrete state. Here, sustainability is understood as the “emergent property of a conversation about desired futures”, informed by the relative knowledge of multiple trade-offs (Robinson, 2004: 381). This procedural understanding (1) respects the dynamic interplay of dimensions of sustainability, (2) is based on participation in a discursive field, (3) invites to explore multiple possibilities, and (4) recognizes cultural, historically contingent contexts framing both experienced realities and projected futures through “world-making” (Maggs and Robinson, 2016). It acknowledges agency and endogeneity: Futures are shaped by the interplay of agency, structure and serendipity. This social interaction can be fostered in SJs.

Exploring alternative futures is a leap into the unknown that benefits from a participatory creative process, a process that imagines futures and explores questions coming from these futures: “What if the challenge of sustainability is not to prove the world more real but to prove it more imaginary” (Bendor et al., 2017)? Creativity is required in the search process of sustainability (Dieleman, 2008; Stables, 2009; Kagan, 2011; Sandri, 2013) – not merely individual but also group creativity, given that sustainability is a collective emergent process that cannot be decreed by single experts. This implies an understanding of “social creativity” (Purser & Montuori, 1999) that integrates individual and collective creative processes (Paulus & Nijstad, 2003).

Collective divergent processes are involved in envisioning “plausible and desirable futures” (Bai et al., 2016), whereas enabling the development towards such futures also requires convergent thinking. These alternating divergent and convergent thinking processes are key components of DT.

The development and use of methods and approaches that aim at increasing creativity and that foster the ability for imaginary and long-term frameworks can be seen as a technology to address sustainability as a wicked problem (Frame, 2008, p. 1113). Wicked problems are complex and indeterminate (Buchanan, 1992, pp. 15-16), they are hard to describe, understand and solve. Dealing with sustainability meets all the challenges a wicked problem implies (Rittel and Webber, 1973): they are neither right nor wrong (but rather good or bad), have many interdependencies, are multi-causal and often include conflicting goals. Weber and Khademiam (2008) argue that wicked problems are unstructured, cross-cutting, and relentless: it is difficult
to distinguish between causes and effects and any wicked problem could be viewed as a symptom of another problem. Attempts to address wicked problems often lead to unforeseen consequences, since wicked problems exist in complex systems that exhibit unpredictable, emergent behaviour and that exist at different levels such as whole socio-technical areas (e.g. the educational system), concrete spaces (in e.g. organisations, or cities) or at the supranational level (which can be geophysical, financial, digital, etc.: Jaeger et al., 2013). As sustainability is a super wicked problem (Levin et al., 2012) consisting of many wicked (sub-)problems (like climate change, expanding demographic and technological developments, resource limitations and many more), it triggers many of those systems simultaneously (and that is why it is almost impossible to predict and deliver single conclusive solutions). Murphy (2012, p. 18) identifies three difficulties that are characteristic for sustainability as a wicked problem: the distant consequences of unsustainable practices in both time and space, the failure of local attempts to upscale sustainable practices to the broader societal level (of regimes: Geels, 2002), and the underrated urgency of change. These correspond to Levin et al’s (2012) super wicked problem’s causation of the policy-making tragedy where traditional analytical techniques are ill-equipped to identify solutions, even when it is well recognized that actions must take place soon to avoid catastrophic future impacts. All these characteristics of wicked problems, which are implied in the “grand challenge” (Cagnin et al., 2012; von Schomberg, 2013; Kuhlmann and Rip, 2014) of sustainability have to be understood and considered in (private and public) attempts to tackle this challenge. Abductive reasoning – as practiced in DT – and improvisation – as part of SJ – are of potential use here.

To conclude, both DT and SJ strive for creativity: DT’s divergent and convergent thinking and SJ’s interplay of individual and collective performance provide some relevant ingredients for envisioning desirable futures. DT’s abductive reasoning and SJ’s improvisation may help address the wickedness of sustainability. Yet, the issue remains whether current uses of DT in SJs harness their full potential for sustainable futures.

3. Material and methods
We used an exploratory single case study research, based on in-depth participant observation, videography and in-depth interviews, in order to find out more about which potentials, which qualities and which limitations evidence themselves in its practice of DT.

3.1. Study design: an explorative case study
Case studies are suitable for exploratory research and for theory building (Voss et al., 2002, p.198). The analysis of a single case does not aim at generalizability, but it is an appropriate method for a more in-depth analysis that addresses questions such as “why and how”, in situations where the observer has no control over the events and attempts to understand, systematize, and analyze the facts (Yin, 2009). Our qualitative case study offers the opportunity to uncover imaginative, creative and productive group processes.

The selected case of SJ should be the work of societal actors engaged for sustainability and connected both to the grassroots actors in their locality and to economic actors, from where the business practice of DT is already known, in order to allow us to observe a case where this understanding of DT is transferred to the specific social field of sustainable development. Besides, it should operate in a favourable context where the local authorities are supportive of such an initiative and of sustainable urban development in general (and not in a priori adverse conditions). Our unit of analysis is the 2015 edition of a SJ in Germany.

3.2. Data collection and analysis

We chose a mixed-method approach for the data collection in order to triangulate multiple sources of evidence obtained from the data at the later analytical stage: participant observation (PO), videography of the SJ on two days of the event, qualitative semi-structured in-depth interviews (Berg, 2006; Esterberg, 2001; Gläser and Laudel, 2010) conducted several months after the event (2016-2017) with jam organizers and jam participants, and informal exchanges (unstructured conversations at work meetings and personal communications) with the local coordinators of the jam. Several of our research assistants as participants1 were conducting PO (DeWalt et al., 1998) at the jam over two and a half days. They split up into different teams, produced field notes, and delivered different critical reflections of the experience with and in the jam. Crucially, they were also aware of the element of observer’s self-reflexivity, which has to be constructively integrated into the research by means of various strategies2. This led to more epistemologically modest statements, to a more differentiated understanding of phenomena, and to a more tangible way of dealing with maxims of scientific ethics (Muckel,

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1 Andreas Kirschig, Sandra Gebauer, Jaqueline Goertz, Tim Bauer, Raphael Baczyk, Valerie Stampa. POs were among the best students (in sustainability science and innovation management) involved in our research project. PO_5 was employed one year as research assistant and acquired a deep knowledge of the research project. PO_5’s capacity for critical distancing and self-critical reflection provided especially insightful empirical data.

2 First, the addition of other types of data, such as interviews and video analysis, puts the selectivity and subjectivity of the observation protocols into perspective. Second – we follow the majority of qualitative sociological authors who perceive the observed as involved in the production of ethnographic knowledge as they “dictate through their utterances and actions something in his [the researcher’s] observation protocols” (Kalthoff 2005: 77). And third – given their knowledge on DT and sustainability, the observers were able to make a meta-analysis of the process, including the sustainability issues missing in the jam, the lack of diversity and their role as part of the groups.
They thus were able to recognise and critically reflect their effects not only within the groups but also on the whole event that they have helped shape through their scientific background and implicit understanding of sustainability. For the videography we, employed overt CCTV-style continuous recording (Shrum et al., 2005) for a posterior detailed analysis of the video material (Knoblauch et al., 2014).

For the data analysis our interdisciplinary research team used qualitative hermeneutic-interpretative methods of content analysis (Mayring, 2010; Mayring and Fenzl, 2014) with open coding (inductive coding along the data) in order to understand the complex reality of the SJ. Our research team did a triangulation and synthesis of: (1) analysis of the field notes and reflections from POs (data hereafter labelled as “PO_1” to “PO_5”), (2) analysis of video material (labelled as “CCTV”)

4. Case Study Analysis: the Sustainability Jam (Germany)

As discussed above, DT used as a method in SJ may have the potential to address wicked problems of sustainability and could be a suitable format for envisioning desirable, plausible futures (e.g. Carlsson et al., 2014). We identified one SJ (conducted in 2015 in Germany) that met the criteria mentioned in the methods section above: The Agenda 21 Office of the municipality lent this SJ event explicitly its moral support and took part in the 2015 SJ’s jury (in 2014, the city’s Lord Mayor had been the event’s patron). That city has been generally championing sustainable urban development for many years. The organizers of the Jam were local activists and professionals, creative practitioners and entrepreneurs working at the interface of “Economy for the Common Good” (a professed alternative to profit-oriented capitalism), social entrepreneurship and grassroots activism for sustainability, who were engaged in the local sustainability scene. This specific SJ event started out as part of the yearly world-wide “Global Sustainability Jam”, with its first two editions in 2013 and 2014, and then the event date got out of sync in 2015. While keeping most of the concept, the jam developed into an independent local event. The explicit aim of the SJ event, conducted annually from 2013 to 2015, was to mobilize creative processes for sustainability and connect them with the city’s efforts for sustainable urban development.

3 Only phase 1 (promote divergent thinking) was video-recorded.
Through in-depth analysis of this specific SJ, we identified qualities and shortcomings of DT use that may be representative for other similar events. The analysis identified issues that would require addressing for DT in a SJ to gain in relevance for sustainability.

4.1. Structure of the Jam

The Jam applied a classic DT process, and was split in two phases following the idea of Paul Laseau's Funnel (1980) who described the design process as an overlap of ideas elaboration (opportunity seeking) and ideas reduction (decision making) (PO_2). This funnel method brought about an overall convergent process even though some divergent processes still occurred within it (PO_5).

<table>
<thead>
<tr>
<th>Phase 1 (promote divergent thinking)</th>
<th>Design Thinking steps</th>
<th>Create choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand and Observe</td>
<td>empathize (1)</td>
<td></td>
</tr>
<tr>
<td>Define a position/common standpoint</td>
<td>define (2)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase 2 (apply convergent thinking)</th>
<th>Make choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find ideas</td>
<td>ideate (3)</td>
</tr>
<tr>
<td>Develop a prototype</td>
<td>prototype (4)</td>
</tr>
<tr>
<td>Test it</td>
<td>test (5)</td>
</tr>
</tbody>
</table>

Table 1. The two phases of the selected Jam

“The outspoken goal of the jam was for the groups to 'design' applicable solutions to current sustainability problems” (PO_5). Coaches accompanied participants teams through every step of the process (PO_2).

The chronological structure of the Jam was split over two and a half days, applying different formats and tools to achieve a DT-based workshop format in the service of sustainable development. The SJ was structured as described in table 2. Our description and analysis of the case below follows the Jam’s chronological structure, including observations and interpretations excerpted from the data, which serve then as a basis for our discussion of results in the next section.

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4 Divergent thinking processes are meant to continue in phase two, but gradually leave ground to more convergent processes. However, in this SJ, our data indicates that several participants perceived these as two rigid phases, whereby phase 2 would include only convergent processes. This raises questions about the validity of such a usage of a two-phased framework in practice.
<table>
<thead>
<tr>
<th>Phase</th>
<th>Working structure of the Jam</th>
<th>DT process</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;Check-in: welcome café&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Opening comments</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td><strong>Promote divergent thinking</strong></td>
<td>Day 1</td>
</tr>
<tr>
<td></td>
<td><em>Understand and observe (part 1)</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Keynote speech about Creativity and DT</td>
<td>empathize (1)</td>
</tr>
<tr>
<td></td>
<td>• Warm-Up &amp; get to know each other: in groups (incl. elaborating the individual understanding and definition of sustainability for every participant)</td>
<td>create choices</td>
</tr>
<tr>
<td></td>
<td>• Introduction DT &amp; presentation of the theme in the Jam 2015 (incl. keynote speech about creativity techniques)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Working package 1 (in teams: team division, naming and brainstorming)</td>
<td></td>
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<tr>
<td></td>
<td>Dinner together incl. two keynote speeches:</td>
<td></td>
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<tr>
<td></td>
<td>• Carbon footprint of the Jam;</td>
<td></td>
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<tr>
<td></td>
<td>• Success story of an ecological fair fashion company.</td>
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<tr>
<td></td>
<td>Breakfast</td>
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<tr>
<td></td>
<td>Art of Hosting</td>
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<tr>
<td></td>
<td>Keynote speech: “Frugal Innovation”</td>
<td>empathize (1)</td>
</tr>
<tr>
<td>2</td>
<td><strong>Apply convergent thinking</strong></td>
<td></td>
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<tr>
<td></td>
<td><em>Define position</em></td>
<td>define (2)</td>
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<tr>
<td></td>
<td>Working package 2: (define a common standpoint, observe &amp; user research)</td>
<td></td>
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<tr>
<td></td>
<td>Presentations (by participants teams) 1: Personas</td>
<td></td>
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<tr>
<td></td>
<td>Lunch</td>
<td></td>
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<tr>
<td></td>
<td><em>Find ideas</em></td>
<td>ideate (3)</td>
</tr>
<tr>
<td></td>
<td>Working package 3: ideation and brainstorming</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Presentations 2: first prototypes</td>
<td>prototype (4)</td>
</tr>
<tr>
<td><strong>Prototype</strong></td>
<td>Dinner (vegetarian restaurant, self-paying)</td>
<td>End Day 2</td>
</tr>
<tr>
<td><strong>Breakfast</strong></td>
<td></td>
<td>Start Day 3</td>
</tr>
<tr>
<td><strong>Keynote speech „Prototyping“</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Test</strong></td>
<td>Working package 4: User tests and finalizing prototypes</td>
<td>test (5)</td>
</tr>
<tr>
<td></td>
<td>Presentation of results</td>
<td></td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>SJ 2015 End stage</td>
<td></td>
</tr>
<tr>
<td><strong>Additional phase</strong></td>
<td>Assessment of the results by a jury</td>
<td></td>
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<tr>
<td></td>
<td>Decision of jury/ announcement of the winner teams</td>
<td>End Day 3</td>
</tr>
<tr>
<td></td>
<td>Feedback with all participants</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Detailed chronological structure of the selected Jam

4.2. First phase (create):

The first day started with a general introduction giving first insights about DT as a creative method. Participants were told that “rules get broken” so that “one gets free to become really creative” (PO_2). This was experienced as “positive and inspiring” (PO_5), allowing to “understand the relation to creative processes” (PO_3). Warming-up exercises followed, which the POs experienced positively: “Collective games and actions helped create a pleasant and friendly atmosphere” (PO_4).

This introductory time also allowed participants to get to discover something about each other at a personal level. POs noted that participants’ motivations included “intrinsic motivation and a thrill of anticipation” but also some “expected personal benefit for their careers” such as “expanding their networks” and “feedback and insights for further development” of a “business idea” (PO_5). PO_5 characterized most participants as “genuinely curious for other people’s ideas” and eager to employ nonviolent communication, and noted that “no-one I talked to honestly expected to produce an invention beyond some sort of illustrative handcraft prototype”. 12
The introductory time (day 1) included five keynote speeches that POs experienced as “interesting but strenuous” and long (PO_2), “too many […] and some superfluous” speeches (PO_3). The video (CCTV) shows that day 1 was dominated by a traditional lecture-like frontal configuration: standing speakers with projected slides or videos vs. sitting, mostly passive audience, all very static. The POs found the speeches too frontal and lacking creativity (although they referred to creativity and creative techniques): These “management” talks about digitalisation, technology innovations and business success already framed the ideas and yet-to-come divergent thinking towards a narrow direction.

POs missed important topics for sustainability such as “social innovations” and “technical innovations for collective use” (PO_5). There were no inputs about the shared aim of the jam regarding sustainability as a wicked problem, and the local context was not thematized either: “What I liked less was that the focus of the Jam moved away from sustainability very fast. In many groups it was primarily about a creative innovation having less to do with sustainability, targeting no particular group or issue of the city” (PO_1). “The city as context was completely absent. I found it a pity, as I expected to learn about local problems” (I1). “So little was known about the city […] I missed context” (PO_3).

In retrospect, interviewed POs missed input for sense-making: “It was not explained, why do you do that at all? What is the meaningfulness that justifies such kind of events at all? Who benefits from this and why is it may be necessary to do something like that for society as a whole?” (I1).

POs reported a positive effect of the warming-up exercises with the participants loosening-up. “Introductory games helped the participants invoke childlike playfulness” (PO_5). However, it was just one exercise repeated five times, producing only little physical movement for short times: Most time was spent in a standing and static frontal interaction between moderator and participants, with short moments of informal chats (CCTV). The game was about some aspects of participants diversity (age, residence, education, etc.), however the teams had been pre-selected according to undisclosed criteria (CCTV, PO_3): The 26 participants had already received coloured name tags (identifying six groups), based on earlier filled-in forms; “no-one had the opportunity to ask further” (I1). Upon video analysis, the game looked almost arbitrary, lacking meaning integration into a wider learning process (CCTV), while POs were to experience the teams-allocations as “non-transparent, why and which are the criteria of group selection and division within the groups. Group formation led in some groups to a very difficult
process of finding a right solution” (PO_3). POs experienced their teams as “not heterogeneous enough in terms of age and background” (PO_5).

Participants then grouped into their teams and shortly discussed three questions with each other. They were still standing and static (CCTV). Definitions of “sustainability” were evoked only at this time with the third question: “What is sustainability to you? You have one minute!” (which became 4 minutes [CCTV]). There was no shared understanding of sustainability at the end of this process: “answers were wildly different” (PO_2) and “we never directly discussed how sustainability could be defined as a common goal for all jam participants” (PO_4).5

This was followed by the introduction of DT as a method (a frontal static keynote speech [CCTV]) in order to prepare the first steps of ideation. The introduction dealt with sustainability problems as user-oriented problems, and DT was presented as helpful for “the development of individually applicable, material or digital product innovations” (PO_5): “a process to quickly find solutions for problems and test out if it’s really a solution for the problem … quickly design a prototype for a specific customer” (speaker [CCTV]). “The applied understanding [was] reduced to very specific product types. … This frame was transferred, unquestioned, onto sustainability issues. The thus implicit understanding was that sustainability issues can be solved by better satisfying the needs of individual users. The [further keynotes] have further reinforced this understanding by discussing examples of individually usable, sustainable product innovations (sustainable office supplies, as well as sustainable clothing)” (PO_5). Some participants “seemed uneasy about what was expected from them” and experienced “slight bewilderment ... as to how specific we were supposed to be” (PO_5).

Next was the introduction of the SJ’s motto: It was presented as a brief visual, non-verbal amateurish performance (with recorded pop/world music) by the organizers & coaches themselves, to silent puzzled participants (CCTV). POs perceived it ambivalently and differently (“inspiring” [PO_5]; “a very special atmosphere in the room, because everyone was able to enjoy the performance in silence” [PO_2]; “very esoteric [and] unprofessional ... it definitely looked a bit daunting to me” [PO_1]; “overtaxing” [PO_3]; “confusing” [PO_4]). It “opened up a spectrum of possible interpretations though it ... contained obvious cues to topics

5 As students at a university with a strong focus on sustainability research, POs were conscious that their understandings of sustainability differed from those of most SJ participants, and aware of their academic biases across the SJ.
fairly common ... such as solidarity [and] social cohesion” (PO_5). It allowed “space for creativity” (PO_3) and own imagination, shortly suggesting divergent perspectives (PO_5), and caused some irritation and doubts as well as very subjective ideas of what the theme was about (discussed within teams afterwards [PO_4, CCTV]). However, this irritation was reported by POs as feeling awkward (PO_1, PO_4, PO_5). Individual interpretations were later difficult to reconcile with other team members.

The teams then sat down and defined the theme for themselves. At some point while teams were working, coaches put on some rock music and danced the twist for a moment in the middle of the space – a short burst of (spontaneous?) movement that (like the motto performance earlier) was performed only by organizers/coaches (CCTV). The remainder of the evening included an informal vegan buffet followed by two static keynote speeches.

Overall, “even though the first [day] felt very broad and divergent, this might have been rather due to the scale of the abstract ideas we discussed first. It seems to me that our process was not really divergent at that stage but rather convergent in the sense that we were discussing abstract concepts to order and interpret what we had just perceived. Our associations remained in a fairly reasonable spectrum. There were little spontaneous diverging thoughts and original inputs – we were rather like a group of old school ethnologists: trying to rationalize what we had seen from our own background” (PO_5).

The morning of day 2 aimed at developing a persona “guided by very detailed characterization of a person” (PO_5), which implies the goal- and role-oriented “customer profile” of the user for whom the idea is about. “By that time at the latest, the frame from which the problem to be solved should be understood was clearly defined: as the specific needs of the created persona” (PO_5).

The creation of a persona in DT requires either preliminary user research in order to recognise the relevance of the idea for the users’ goals and requirements or it requires the development of a fictional persona emerging from the team experience, making assumptions based on past interactions or expertise of the team members regarding the needs and goals of the particular “user”. Both options were possible and applied by different teams in the SJ. The POs reported that this stage, although guided competently by the coaches and performed successfully by the groups, was too customer-oriented and too close to a business-performing context. “At this stage I clearly realized the pragmatic, market-oriented approach behind DT and grew sceptical of the process” (PO_5).
The video (CCTV) shows that team members talked and wrote little post-its (alternatively sitting around their table and standing around their board) but nobody really moved: The process was again very static. The persona also made it hard for some teams to address their goal (e.g. universal communication without language borders; causing one team to be “very dissatisfied and unhappy with the situation” [PO_2]).

The teams presented results, which were expectedly individually or group-oriented product- or service innovations (no social or institutional innovations). The professional graphic recorders enabled a good integration of the ideas. Most teams stood up and formally presented their persona in the third person (CCTV). One team “improvised a performance that took up the motive” of the SJ motto (PO_5). That attempt at artful creativity was met with mixed responses: “There was little feedback, I perceived some sort of animosity from [some] participants” (PO_5).

4.3. Second Phase (make choices):

In the following working packages a prototype of the ideas was to be built, tested and finalised in a simple and understandable way. The POs attest that the prototyping was an exciting experience with “many different materials” and very good graphic recording (PO_3, PO_5). This allowed a good visualisation of the ideas. Work was “focused” (PO_2). However, similar to the cognition of a business frame with user-oriented personas, the POs perceived this stage as limited to the material available, which enabled visualisation mainly of product and digital innovations. “No group hits upon the idea of developing a prototype exceeding the spatial dimension of a hand-carried gadget” (PO 5). The potential of using different elements present in the room was not taken up, such as some “rooms” panels (“bedroom”, “playroom”, etc.) by an artist, positioned by organizers as mere décor for the event [CCTV], though they could have “invited to interact and test stationary prototypes in specific spatial scenarios” (PO_5).

The process was perceived by POs as creative yet time-pressured and overly rationalizing-convergent. “The time pressure somehow impaired this process. We partly attempted to immediately sort the categories we had produced, which always blocked the flow” (PO_5). Consensus-finding was also hindered by the “lack of time. The group dynamics took then a wrong direction and people disagreed on the process” (PO_2). PO_5 noticed that in yet another team “there was no openness but instead too much time pressure and too much criticism [while
some] concerns were ignored”. In the team seeking universal communication, which was getting stuck, the “user tests, out on the streets” were conducted a second time, at the coach’s request, although the team felt “it would not make sense” (PO_2).

4.4. Third phase (evaluate choices)

The organizers of the SJ aimed at communicating the ideas by inviting a jury with experts who would evaluate the ideas and decide about the “best” ideas created. This step was perceived by POs as a “total break of the concept” where three days of creative co-working and feel-good atmosphere were followed by a competitive evaluation of three “best concepts” by a jury, “reducing the process to the strength of the concepts” (PO_3). POs resented this experience and felt that most ideas were thus discarded. “It was said: that's good, that's bad and then [concepts] were graded that way. So there was a winner, and that's the way you've suddenly come into competition” (I1). “Despite positive words, ideas were broken down to usability and feasibility ... The positive was lost for me” (PO_3). “I had the feeling that the jury didn’t know exactly what we have done the days before and what our purpose in this jam was about, and my impression was that they didn’t make a point of a sustainable concept but rather of an idea that could be implemented quickly and cheaply and without additional efforts. This break in the proceeding of the jam provoked my resentment ... all the other ideas which were not selected ended up so to say into the trash”. (PO_1). One PO felt they were “slaughtered” (I1).

At the end, no space was created for genuine “constructive critique” feedback by participants (I1). A later follow-up meeting was cancelled. The winning team did “win” a meeting with coaches to develop their idea further.

4.5. The overall framework of the SJ

Some reported issues concerned the SJ as a whole. POs expressed feelings of exhaustion and a loss of motivation over the three days. They experienced the SJ as “too long” and “strenuous” (PO_2, PO_3), as well as time-pressured and stressful ("The time pressure was clearly felt and we all got nervous” [PO_5]; POs felt their “creativity was hindered” [I1], “creative processes were interrupted too fast” [PO_4]). These feelings can also be related to the general lack of movement and vitality, with long talks, mostly static activities and not much moving and doing (CCTV). The focus on mental activities and the lack of embodied activities led to stress and

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6 POs also commented that as a self-paying event, the joint dinner in the vegetarian restaurant was excluding group members who could not afford the expense (I1). This showed a lack of awareness for the social dimension of sustainability.
insufficient emotional involvement. Most interactions were either within the small teams or
frontal plenary settings (CCTV), leading POs to miss opportunities for wider group interactions
(PO_2, PO_4). The time-pressure, lack of training and overall stress-level also limited
participants ability to employ nonviolent communication and avoid destructive criticisms
(PO_5).

At a deeper level, POs missed meaningfulness: “The meaningfulness, necessity of the jam or
DT in innovation development for sustainability was not correctly presented ... What is the goal
of this event?” (PO_3). Asked months later again about the aims of this SJ, an organizer
responded it was “to turn the topic of sustainability into a pleasurable lifestyle, away from its
Birkenstock, moral high-ground image ... [It] should arouse sustainability awareness and
sustainability activism ... Participants from other cities then bring it to their cities [i.e. organize
SJs themselves], that’s what just happened” (I2). POs also generally missed the local context
and an embeddedness in the city’s specific sustainability issues. To this question, an organizer
responded that the SJ “is embedded in the Global Sustainability Jam and that's a global affair,
and actually you're uploading your projects/product ideas developed during the weekend online,
on an open source platform” (I2). The organizers hoped to cooperate with companies and
business associations (I2). These answers point to the SJ as an open-source business event,
positioning sustainability as a lifestyle, with little to no concern for local place-making.7

5 Discussion of Results - Identification of four major issues

Our empirical data points to four major issues with the concrete deployment of DT for
sustainability in this SJ: The first two are design flaws of DT revealed by the way it is practically
deployed in the SJ. Reflection on these flaws and on the cognitive, learning and social
limitations of the SJ suggested by the data (section 4) uncovers two deeper limitations of the SJ
that warrant further critical understanding.

5.1. Who are the users?

The first issue touches upon the question: Who are the “users” related to current DT practices
for sustainability, i.e. for plausible and desirable futures? The strong focus on individual
“personas” (user-centric view) for whom specific “products” are to be designed, as well as the

7 The language of the press release of the event also transpired this same business logic.
subsequent strong focus on products and outputs perpetuated a “business” logic and ideation process, which hindered creative ideas for sustainability and alternative (alter-economic and non-economic) logics. “Important opportunities were missed to detach DT from the traditional relation to product development and to establish a more complete concept of innovation ... In the course of the Jam there were no approaches that would have triggered a different understanding of sustainability issues than the user-orientation of classic DT. On the contrary, all the jam's practical work, including the content from the introductory lectures, was designed to bring a user-oriented understanding of the problem to the fore” (PO_5).

The user-centred DT approach as used traditionally in the business-oriented field and as practiced in our case proved to be too individualistic. The SJ reproduced a business frame and left little space to explore beyond an individualistically biased framework.

Furthermore, the introductory phase of the SJ failed to create a common understanding of global sustainability challenges, a deficit that led to a limited understanding of the conception of desired futures. The development and utilisation of ideas were neither aimed at resolving global sustainability challenges, nor related meaningfully to the local context; rather they addressed the usual corporative logic of creating innovations for business.

5.2. What are the solutions?

This leads to the second issue that relates to the question: What are “solutions” when sustainability is the emergent property of a societal negotiation process dealing with wicked problems in a historically contingent context? Here, the role of prototypes as deployed in the SJ, needs to be critically reflected. Prototyping relates to turning ideas into something tangible, towards a product. Innovation is not recognized and conveyed in its entirety, focusing only on needs of users. However, since sustainability issues are complex in their impacts and future generations need to be considered, the ideas may not always exist in the form of practical or feasible “product innovations” that can be physically prototyped.

Furthermore, the limited diversity of participants in the SJ, in terms of areas of experience or expertise, limits access to the multi-dimensional aspects of sustainability issues, further thwarting the search for complex options to advance sustainability.

These two design flaws in the SJ thus point to a failure to address systems complexity. The systemic and emergent nature of sustainability was missed, with no consideration of (1) the diversity of agents involved, including the needs of non-humans, (2) the wider institutional, social, ecological and geophysical challenges and consequences at multiple spatio-temporal
scales (well-beyond the needs of single “users” or of ideal-types symbolizing target groups), and (3) the complex ethical questions related to sustainability.

Complex problems require complex approaches. The DT process of the SJ was insufficiently complex: As a linear, iterative and planned process, it was solution-oriented and aimed at providing clear concepts and borders. Rules such as “no criticism”, “no exchange of persons between teams”, and strict time limitations for ideation restrict discussions of emerging ideas. Excessive focus on proximate solutions hampered a wider and deeper learning process. Behind such seemingly practical issues laid an approach to learning that forbade to dive into deeper realms of qualitative complexity, as characterized in the third issue.

5.3. How to test complex solutions?

The third issue relates to a web of questions that further reveal the depths of complexity missing in the SJ: How does one build and test sustainability “solutions” in ways that mobilize the transdisciplinary ways of knowing that are needed to address highly complex challenges? How can the emerging properties of sustainable futures be mobilized in the generation of possibilities? How can social creativity and the transdisciplinary learning of qualitative complexity be fostered?

The case study data shows that convergent processes happen too early in the stages of DT and result in less social creativity than possible otherwise. There is not enough space for divergent processes, which are important for the DT process to be open and creative. The insufficient diversity of participants regarding personal background hampers team dynamics and social creativity. Group coherence and group diversity, as well as convergence and difference between individual approaches, were not successfully balanced, failing to avoid both the risk of conformity through group-pressure (Nemeth & Nemeth-Brown, 2003) and the risk of destructive emotional conflicts (Milliken et al., 2003), whereby affective relations partly failed to balance trust, mutual stimulation, cooperation, respect for differences and tolerance for paradoxes. Intra- and inter-personal divergent and convergent processes were not engaged with in parallel, through simultaneous exploration, development and evaluation, as they should have (Sawyer, 2003) – instead they were expected to occur successively through neatly iterative cycles.

The SJ followed a problem-based learning frame (as sustainability science also often does) that focuses on solutions that precipitate closure through finite answers, leaving little space for a “question-based learning” (Haley, 2011), i.e. missing enabling and “ennobling” questions that would highlight qualitatively complex relations and indeterminacy. A focus on thinking and
scarceness of corporeal “doing”, in a static setting with scarce movement, prevented the unfolding of transdisciplinary ways of knowing and the associated participative-embedded-embodied cognition and learning.

This third issue reveals the SJ’s failure to address qualitative complexity, whereby various elements relate to each other in ways that are at once complementary, competing, antagonistic and belonging to a wider unitary process, without any single of these four relationships overseeing the others (Morin, 1977). A capacity to work with ambiguity, ambivalence and uncertainty would be required, not attempting to solve all perceived contradictions but understanding paradoxes and managing them (Kagan, 2011, 2017). The required complex thinking (Morin, 1977, 1980, 1986) involves four aspects that the SJ failed to mobilize: recognizing and working with emergence; integrating uncertainty and non-knowing into a process that combines various ways of knowing; sharing partial views and acknowledging the value but also the limits of any expertise or analysis; and mobilizing the generative intelligence of desires and imagination (Maggs and Robinson, 2016) for anticipation beyond the limitations of incremental thinking.

5.4. How to change social practices?

The fourth issue is rooted in yet another question that reveals the SJ’s societal limitation: How may DT contribute to widely affect social practices towards sustainability transformation? Schatzki (2001: 11) defines practices as “embodied, materially mediated arrays of human activity centrally organized around shared practical understanding”. Actors produce and reproduce the web of practices and are embedded in this web - changing practices from within therefore provides the “paradox of embedded agency” (Seo & Creed, 2002) or - to put it differently - poses a catch 22: How to change practices when these practices are used to make the change? Defining ‘the problem’, creating personas, producing solutions, and announcing ‘the winner’ are typical practices encountered in DT for business purposes, which provide an inappropriate framing for sustainable development questions. Furthermore, how is an ongoing process supported, beyond single workshop-like events? Indeed, SJs need to apply different practices to change social practices more widely in order to work for sustainability.

The SJ occurred within a specific space unrelated to a local context, aiming at producing “open-source” results. While all kinds of ideas were appreciated, a jury selected one “winner” team while other ideas disappeared in online “drawers” and got lost. If SJs are seen as a mere tool to generate ideas at the time and place of single events, any relevance and significance of outcomes of social creativity for deeper innovation will stay well below their potential. For ideas to unfold
and encourage further effects on wider social practices, an institutional entrepreneurship beyond the workshop itself would have been required, which was here absent: Neither did the SJ manage to change the “rules of the game” of a dominant business logic, nor was it followed by testing and communicating new rules and contextualising them beyond a single workshop. There was no contextualisation within the local community for further development and implementation of ideas. No changed social practice was initiated, i.e. a way of doing things that generates new habits and balances routine and indeterminacy, being embedded in a cultural context and meaningfully integrated in an urban fabric of local communities, organizations and social conventions. Only if a mindset leads to a workset (i.e. integration into an individual’s behaviour) and is shared across a community (Weisenfeld & Hauerwaas, 2018), does changed social practice emerge.

6. Reflection of Results

The four issues identified in our empirical case corroborate the validity of issues already raised in some of the critical literature on DT: Some researchers have questioned the suitability of commonly practiced DT formats for transformation processes in terms of creativity and embodied learning (e.g. Küpers, 2016) since the current application of DT for sustainability is still often misunderstood as a mere set of tools & methods (Marzavan and Augsten, 2017) and guided by the business logic in organisations. According to Marzavan and Augsten (2017), DT would have a much wider potential when considered as a “strategic art” providing principles and strategic guidelines, rather than providing only tools, techniques or even methods as seen in our case study.

DT’s specific limitations in dealing with the super-wicked problem of sustainability have already been suggested by some researchers: Fischer (2015) argued that, while sustainability issues focus on present and future generations, the framing of DT is too user-centred and too focused on the needs of individuals. Instead, it should concentrate more on the needs of current and future generations. Moreover, the super-wicked problems of sustainability are not always easy to describe and understand and thus, a framing needs time and multiple expertise (Fischer, 2015). Thus, both the DT working process and the team diversity may need the inclusion of more experts (next to the non-experts) than was the case at the selected SJ.

One DT-critical approach to enhancing the potential for qualitatively complex thinking is found in Wendelin Küpers’ theoretical proposals. Based on a critique of reductionist and disembodied orientations in some implementations of DT (prioritising instrumentally oriented action),
Küpers (2016) picked up the notion of "Design Doing" (DD) with the goal to more radically re-integrate materiality, bodily qualities and lived experiences into the practice of designing for sustainability, with inspiration from phenomenology. The DT processes need more re-embodiment, better integration of thinking and doing, and more attention paid to how things, events, and life-worldly meanings are embedded in situations. Küpers’ DD discourse shares our critique (rooted in Edgar Morin's qualitative complexity) of solutionism as producing a limited problem-solving process. For Küpers, the iterative design cycle of DT perpetuates a misleading dichotomy between knowing and acting in the world, abstracted from the complex messiness of life-worldly practices.

The failure of the SJ to sufficiently address qualitative complexity points to a deep paradigmatic challenge that concerns not only DT but also sustainability science, as both fail to transgress the limits of analytical reasoning (Buchanan, 1992) and of any expertise - not only to involve “knowledge that lies outside the walls of academia” (Miller et al., 2014, p. 243) but also to involve other, wider, embodied ways of knowing (Dieleman, 2017, Kagan, 2017), in order to more radically change social practice. Even systems thinking, though praised by sustainability scientists (Rieckmann 2012), generally maintains a cybernetic bias (i.e. one that reduces complexity to models of self-regulation, programmes and orderly logics) that lacks qualitative complexity (Morin 1977, Hörl 2016). Much transdisciplinary sustainability science, whether or not recurring to SJs, fails to engage with transdisciplinarity in the sense of Basarab Nicolescu, i.e. a further and deeper epistemological and methodological exploration beyond the limitations of traditional modernist (inter-)disciplinary science (Nicolescu, 2002, 2014), seeking to learn from other ways of knowing, reaching for a unity-in-diversity of knowing that is more perceptive of the qualitative complexity of ecologies and societies (Morin, 1977, 1980, 1986).

Authors seeking this paradigmatic change called for an “embodied transdisciplinary hermeneutics” (Dieleman, 2016, 2017) and for the use of arts-based methods and sensory ethnography (Heinrichs, 2019) initiating an “artistic turn [toward] artful sustainability research” (Kagan, 2017). Their critique offers an epistemological and methodological ground on which to recognize and address the limitations of the SJ, from the lens of artistic and arts-based research. Even though the correspondences, differences and difficulties of distinguishing art and design form a long-disputed question beyond the scope of this paper (together with the complex and various theorizations of “designerly ways of knowing” [Cross, 1982]), we need to stress the value of the arts in the search for complex methods to tackle sustainability challenges. This is all the more important given the widespread solutionist tendency among sustainability researchers, who find appeal in “design” because of its traditional association with
functionalism and utility as opposed to art, which is associated with open-endedness and interpretative freedom.

The potential of the arts lies in the combination of (1) an enhanced access to qualitative complexity and (2) an ontological and epistemological re-reading and questioning of social conventions and institutions. Art as a process of inquiry may offer these qualities when it develops (1) “aesthetics of complexity” beyond cybernetics (with a “sensitivity to patterns which connect” through which such art links complex processes of interaction in the living world to the complexity of cultural processes, allowing longer-term and more complex perspectives), and (2) an “entrepreneurship in conventions” that both raises suspicion against conformist social practice and stimulates alternative experimental practice that raise conviction in unconventional logics (Kagan 2011).

Arts-based inquiry can transcend abstract, reductive, cognitive and verbalized knowing, as it mobilizes embodied cognition (i.e. kinaesthetics, the senses, emotions, intuitions, the subconscious and tacit knowing) and explores the space between what is known and what is not while allowing ambiguities or ambivalences, and activating reflexivity and radical imagination (Dieleman 2008, Barone & Eisner, 2012, Savin-Baden & Wimpenny, 2014, Leavy 2015, Bendor et al., 2017, Kagan 2017, Galafassi, 2018, Galafassi et al., 2018b). Participatory arts-based formats for sustainability performatively engage participants in corporeal learning and embodied expressive explorations (Heras & Tàbara, 2014), generate alternative interpretations mobilizing tacit knowing (Galafassi et al., 2018a), combine imagination with open-ended experimentation to open up futures-oriented questions and perspectives (Kagan 2019), and/or envision alternative ontological worlds (Maggs & Robinson 2016). Arts-based processes can help make the very ambiguity of the term “sustainability” productive through “a process of context-based meaning finding [...] in which communities yield their own, context and time specific interpretations of sustainable development” (Eernstman & Wals 2013: 1645), whereby the interpretation of artworks can foster “a non-functionalist approach to systems thinking” (Molderez & Ceulemans, 2018: 768).

Overall, artful qualities were largely lacking in our empirical case study. The SJ did include one arts-based element - the performance of the motto by the organizers/coaches, which represented an aborted attempt in the direction we suggest. “Witnessing the performance made me rethink some of the preconceptions I had about the jam such as its outspoken practical approach ... Sitting around the sculpture, reenacting the corporeal setup, my group and me could

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8Involving artistic process does not constitute a guarantee to reach certain qualities, and some studies cited here do unduly over-generalize their results, bestowing all art with the properties demonstrated by specific artworks and processes.
imagine ourselves in this scenario” (PO_5). However, the performance of the year’s motto was too amateurish to provoke much inspirational vicarious experience for its audience. It was not interactive either (i.e. not asking participants to explore and interpret the theme performatively) and thus did not provide performative learning (except for one team shortly). And it was “far too concrete” (PO_5) to allow much interpretative depth. PO_5’s reflection made him aware of how participants squandered the small potential it offered, and how the overall framing made any other development improbable: “Instead of using the performance as the starting point for a promisingly divergent thought process, we tried [in the team] to decode the concepts we recognized in the performance and to look for the general in the particular ... This was no imaginative process but more of an investigation ... The pressure I felt to reduce the performance to a specific, usable sub-aspect was influenced by the previous presentations that had already laid a very clear focus on practical and objective solutions as the goal of the jam” (PO_5).

7. Outlook

Our results point to a clear direction for improvements, requiring further research. While working with arts-based approaches would allow a deeper engagement with qualitative complexity, core practical elements of DT such as personas and prototypes would then need to be reconsidered and integrated into wider ensembles such as:

(1) **Locus**: a spatial turn must be taken, whereby place-making and the importance of the “Eigenart” of each city’s urban fabric (WGBU, 2016) would be taken into account.

(2) **Socio-Ecological Systems** (Young et al., 2006): a wider systemic view integrating social systems (communities and societies) with ecological systems (species and ecosystems) is indispensable, without which the focus on personas is bound to perpetuate fragmented understanding and unsustainable development.

7.1. Design doing and arts-based methods

We see the need for the institutionalization of a re-oriented, modified SJ inspired by arts-based methods and DD to envision and work towards desirable and plausible futures: DT has been applied to a variety of situations, yet, sustainability’s qualitative complexity calls for critical and transdisciplinary hermeneutics, mobilizing different ways of knowing and of working to question institutional and business frames. Logico-deductive rational thinking needs to be
complemented with experiential learning and embodied expression in order to harness the potential for social creativity and learning through body-mind integration, including phenomenological practice, artful searching and learning, and bodily-group-play. Such qualities were insufficiently developed in our case study, leading to a lack of embodied cognition (Lakoff and Johnson, 1999). More embodied engagement and knowledge production would integrate different senses and stimulate sensory abilities in connection with the environment. Participants should be involved in actionable formats that allow them to integrate corporeal activity with the critical exploration of sustainability issues and with complex thinking for sustainability transformation. They should engage more into ambiguous play, bodily performance and improvisation (Küpers 2017a, 2017b). More attention to tacit knowing - that otherwise remains immersed unlike explicit knowing (Polanyi 1967), and highlights the bodily sensing that is integral to sense-making and to sensible designing, can be brought about with DD and arts-based inquiry. More attention must be payed to place-making, stressing how the context (and "con-textures" - Küpers, 2015) of material and cultural ecologies intervenes in the embodied inter-subjective nexus of experiences, intentions, responsiveness and interactions of the self, others, and things. Such approaches should artfully integrate and combines divergent and convergent processes through embodied cognition, rather than iteratively alternating divergent and convergent processes.

7.2. scenario building and role play
Prototypes need to be replaced with a more integrated format of futures-envisioning, involving speculative scenarios. A valid tool for this is scenario-building: It is a method used since the 1970s to analyse natural resource development (Moss et al., 2010), and already adopted by sustainability science. Swart et al. (2004, p. 139) see scenarios “as coherent and plausible stories, told in words and numbers, about the possible co-evolutionary pathways of combined human and environmental systems.” In a formative sense, next to exploration and knowledge probing, scenarios have a communicative function and support goal-setting and strategy formation (Kosow & Gaßner, 2008). Scenarios also imply the capturing of imaginations, understandings, perceptions and beliefs of the scenario’s designers (Swart et al., 2004). Thus, scenarios serve to increase the participants’ understanding of possible future developments. The integration of scenarios along the DT process not only reduces the user- and prototype-focus in the process but also enables the participants to visualize alternative future developments and “play” with these visions. When combined with artistic methods and formats, scenarios then open up imaginations even further (Bendor et al., 2017). As part of scenarios, role-play could
further enhance the ability of participants to empathize with “non-human-beings” as well as with desires of future generations. In the field of design, such a direction is already taken in an approach known as “Design Fiction” (Dunne and Raby 2013), which holds much relevance to better adapt DT for sustainability. However, a comparative discussion of other approaches to design, (such as eco-design, sustainable design, design for sustainability, transformation design, design for social change) is beyond the scope of this paper focused on DT as applied in a SJ.

Based on our analysis, we sum up the main elements of a possible re-orientation of SJs in table 3.

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<th>Observed SJ (case)</th>
<th>Re-orientation (suggestion)</th>
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<td>Design thinking and testing</td>
<td>Design Doing and arts-based inquiry</td>
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<td>Iterative Phases</td>
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<td>Project time-scale: defined ending point</td>
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<td>Prototype for the user, testing for the persona</td>
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8. Conclusion

Our research highlights some potentials but also several limitations in the application of DT for Sustainability through Sustainability Jams, as exemplified in one case study. DT as practiced in our case study suffers from severe limitations, as an event and a technique that reproduces a socially conformist, user-centric business frame, over-emphasizes technological innovation and perpetuates a questionable ethos of solutionism, while lacking qualities of critical and embodied cognition. However, DT may bear more potential to probe into alternative futures and gain relevance for sustainability transformation if one would integrate arts-based elements, Design Doing, scenario techniques and a critical engagement with institutionalization to further develop and implement ideas in a community, allowing a deeper transformative social practice. Sustainability Jams, once improved to better incorporate systemic and qualitatively complex thinking, may then become places where ideas are prepared to become changed practice in cities. If participants grasp the significance of complex urban sustainability for their cities, they may better deal with the superordinate mechanisms for transformations (e.g. overcoming financial or cultural barriers by strengthening new sustainable practices, introducing sustainability-oriented goals for socio-ecological systems, developing alternative social values, norms and traditions). This would enable ideation that is more adequately aiming at changes in entire systems or in the mindset of whole societies, than the ideation processes we observed in our case study.

Such a re-oriented practice, once it becomes a recurrent event and gains significance for the urban society, may then better contribute to sustainable urban development.

Our empirical research did not end with that conclusion: We engaged in a transdisciplinary follow-up project aiming to further articulate our suggested re-orientation of sustainability jams, with concrete elements. However, the insights from this next stage in our research would go beyond the scope of this article, and will follow in a future publication.

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