

## STUFF MATTERS IN PARTICIPATION: INFRASTRUCTURING A CO-SEWING CAFÉ

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This paper explores how acts of use and participation can be better understood and articulated in relation to the socio-material and spatial conditions of “infrastructuring”. Infrastructuring is framed here as an object of design research and of design research, comprising the social activities and skills as well as the material tools and “stuff” that are integral to alternative spaces of production such as Fab Labs and makerspaces. We bring together theories from three different areas of research (peer production, Participatory Design and social practice theory), building a conceptual framework that is used to analyze extensive empirical material gathered while initiating, running and researching a ‘co-sewing café’ over 18 months with hundreds of diverse participants. Tracing our understanding of use and participation through literature and case analysis, we use illustrative figures and tables to articulate different types and dimensions of use in relation to one another and in relation to the empirical analysis that is detailed and recounted in various ways. The paper concludes by elaborating how types of use in reference to types of stuff provide insight on participant skills, learning and engagement that can result in change of roles over time.

*Keywords:* Infrastructuring, makerspaces, peer production, design, participatory design, user, use

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### INTRODUCTION

In recent decades, there has been a growing number and variety of movements and platforms to open up design to more people and parts of society. People’s ability to design for themselves has been ‘radically and rapidly’ increasing as discussed in discourses of ‘post-industrial design’, ‘open innovation’ and ‘open design’ (Leadbeater et al. 2004; Mazé 2007; von Busch 2008, Fuad-Luke et al. 2015). This ability has been supported through the development of alternative platforms for design, including ‘do-it-yourself’ and peer-production spaces such as Fab Labs, maker- and hackerspaces set-up for and/or by people using tools, equipment and facilities to design and produce their own artifacts (Kohtala 2016; Seravalli 2012). Using such spaces

can potentially enable and empower a user to develop a ‘maker identity’, as they become aware of and develop their own agency and skills and as they become part of a community making artifacts (Toombs, Bardzell & Bardzell 2014). These spaces are thus a highly relevant object of inquiry in design research, through which we can better understand such emerging types of production.

Within design and fashion research, roles of designers and users have long been at stake within discourses of Participatory Design (PD). Since the Scandinavian origins of PD in the 1970s, which involved workers directly in joint decision-making and in the design of their workplaces, PD has been motivated by ‘the social and rational idea of democracy as a value’ to enable and empower people to participate in the process, and to involve the tacit knowledge of users of design as ‘expert of his/her experience’ (Björgvinsson, Ehn & Hillgren 2012, 103). PD thus resonates ideologically with research on peer production and alternative spaces

of production, given its premise of opening production to users as participants, stakeholders and, even, as designers.

A key theoretical as well as practical issue for PD that we extend and develop here is that of 'use'. First, by involving end-users in the design process, for example in making design decisions and even co-designing, PD puts into question the traditional distinction between roles of 'designer' and 'user'. Instead of separate and distinct categories, these can instead be understood as types of use along a spectrum of participation within design and production processes. In order to involve diverse participants in producing future artifacts, PD has systematically developed methods to bring in their knowledge, expertise and experience (Sanders & Stappers 2014). Thus, not only are users involved in design, but also in ideating the eventual use of artifacts – conceiving “use before use” (Redström 2008). Secondly, to fully involve participants, the focus of PD has shifted from the traditional end-product of design to the means. The means for doing design, including the methods, tools and toolkits, as well as other socio-material factors are conceived of as designed and, indeed, as the primary object or product of PD (Björgvinsson et al., 2010). Contemporary PD is increasingly concerned with understanding the design of means for 'infrastructuring' participatory processes.

In this paper, we inquire into types, issues and implications of use in relation to an alternative space of garment production, a 'co-sewing café' that has been studied over the past 18 months. The café is part of the first author's larger doctoral project, which has a mixed-methods approach combining qualitative research and 'research through design' (Koskinen et al. 2012). The set-up, running and ongoing development of the café can be understood as an extended process of infrastructuring, in which participatory methods, tools, materials and space have been considered as designed. Clothes-making techniques are shared, taught and learned amongst diverse participants, including some who are professional designers or dressmakers. As of January

2018, 42 workshops have been held including approximately 314 people.

In addition, the co-sewing café presents an opportunity to attend to and give an account of the detailed composition and development of infrastructuring. Akin to other doctoral projects within the contemporary PD tradition (c.f. Seravalli 2014), the setup, running and development of the café as 'research through design' has been carried out by myself, the first author, as a trained designer attending particularly to the practical material and 'designerly' aspects of infrastructuring. I have also studied the effects of infrastructuring through qualitative research methods tracing design activities, ranging from planning to day-to-day facilitation activities, as well as participant activities over the timeframe of 18 months. This qualitative data enables us to further specify and explore the research question: How can types of use and participation be understood in relation to socio-material and spatial considerations of infrastructuring?

## INFRASTRUCTURING ACTS OF USE AND PARTICIPATION

'Infrastructuring' has become a key concept through which contemporary PD has developed notions of use and users. Indeed, the concept is useful for us in exploring how the roles of 'user' and 'designer' are blurred and continually renegotiated. With roots in the field of Science and Technology Studies (Star & Ruhleder 1996), infrastructuring has rapidly expanded as way to conceptualize the structures of PD processes (Karasti 2014; Karasti et al. 2018), and, further, to shift focus from designing for fixed environments, products or technologies towards a dynamic infrastructure that relates to different contexts (Star & Ruhleder 1996). Karasti and others (Karasti & Baker 2004; Karasti & Syrjänen 2004) have emphasized infrastructuring as an ongoing activity, describing a fluid and dynamic structure enabling and intertwining activities in a process of ongoing development through design and use phases including adaption, re-design and

appropriation (Björgvinsson et al. 2010).

The concept is particularly useful for characterizing the flexibility, openness and adaptability necessary when designing for uncertain outcomes and future use (Hillgren, Seravalli & Emilson 2011). This objective of design, which can be called ‘design for future use’ (Redström 2008), involves infrastructuring as the social, material and spatial structures for sustaining a community of participants (Dantec & DiSalvo 2013). Beyond PD tradition in the workplace, Karasti (2014) argues for PD’s relevance within communities, ‘publics’ and ‘the commons.’ Infrastructuring includes processes of community formation, of forming a public of committed participants (Dantec & DiSalvo 2013) able to take responsibility for a space and its forms of use. Infrastructuring can be understood as fluid and dynamic structure of participation, in which people and their actions cannot be reduced to terms such as ‘user’ and ‘use,’ prompting calls for research on ‘relational qualities’ (Jegou & Manzini, 2008; Hillgren, Seravalli & Emilson 2011). Indeed, infrastructuring involves a constant renegotiation of roles and relations, ‘a continuous process of building relations with diverse actors and by a flexible allotment of time and resources’ (Hillgren, Seravalli & Emilson 2011, 180). Thus, it becomes useful as a bridging concept between short-term PD projects and spaces such as Fab Labs, hacker- and makerspaces set-up by and for participants over extended periods of time (Kohtala 2016).

Conceptions of infrastructuring for such alternative spaces of production are according to Karasti (2014) as yet under-developed. A notable exception is in the work of Seravalli (2012), who has been exploring infrastructuring as a process within a makerspace called Fabriken. Describing the co-designing, establishment and running of the setting, she analyzes their tactics for participant involvement in the space as well as the ‘participatory making of the space’ as a form of infrastructuring. From this perspective, she sees a shift in understanding a makerspace as a fixed infrastructure for a defined use and community, towards spaces for

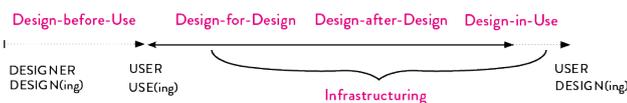
infrastructuring, which offer a dynamically adaptable structure, to be redefined at ‘use time for supporting emerging activities’ (2012, 2). Allen, Agrest and Ostrow argue that, ‘an infrastructuring strategy must not only pay attention to how existing infrastructures condition use, but, in doing so, at the same time also deliberately design indeterminacy and incompleteness into the infrastructure with unoccupied slots and space left free for unanticipated events and performances yet to be’ (2000, in Telier 2011, 173). A challenge for the designer(s) during project time is to keep a future concept or space open, particularly if the future user is unknown, to enable infrastructuring as ‘design-in-use’.

### **Designing for different acts of use**

In instances of infrastructuring, such as in Fab Labs, hacker- and makerspaces, which leave use open to be determined by the user(s), user roles are thus also open. A user may visit once, they may create artifacts and appropriate the space, they may commit to responsible action sustaining the space. Complicating the dichotomy of ‘designer’ and ‘user’, this illustrates the problem of reducing roles to two, fixed categories. Another way to conceptualize use is in terms of acts of participation, following Redström’s *RE:Definitions of Use* (2006; 2008, 410) from an act-based perspective, that is “what we do, rather than who we are.’ Through his argumentation, acts of using, designing or appropriating need not be understood as mutually exclusive, rather, more nuanced and active relations between design and use can be formulated, as further elaborated and illustrated in Figure 1.

In Redström’s terms, the first concept depicted in Figure 1, ‘design-before-use’, is strongly driven by a designer’s perspective to determine use before actual use, e.g. referring to the traditional idea of PD in relation to the design of workspaces (Redström 2006). Secondly, in ‘design-for-design,’ designers aim to enable users to design objects for themselves (Seravalli 2012) – in relation to this paper, the term aptly captures the design of a makerspace. Design-

for-design aims to result in ‘design-after-design’, in which a user becomes the designer during project time when facilitating designers are involved. ‘Design-after-design’ leaves open the possibility for involved stakeholders to initiate their own activities by performing design actions after the design of a given structure is concluded (Telier 2011; Redström 2008). The last notion, ‘design-in-use’ highlights the incompleteness of the designed object or space (Ehn 2008). Design-in-use is also referred to as ‘at use time’ or ‘during use’, in which the activities of users over time are in focus. As these activities may not be fully controlled and, indeed, may be left more or less open, this ‘emphasizes the creativity that lies in the embedding and use over time’ (Dittrich et al. 2002). In a sense, the user completes the design, while in use. With regards to infrastructuring, this requires the designer to open up the object of design to be determined by the user while in use.



**Figure 1: First author’s interpretation of concepts referring to acts of designing and using, in which nuanced and active relations articulate a spectrum between the polarities of design and use.**

Since makerspaces are often part of a larger context, external factors influence participants’ acceptance and the sustainability of the space. Infrastructuring, as understood through conceptions of ‘design-for-design’ and ‘design-in-use’, captures the need for flexibility and adaptability. As a design approach, this can potentially support participation and extended use over time, as they can open for appropriation beyond only using and accepting the existing pre-designed structure. The design of a makerspace, what Seravalli (2012) refers to as ‘design-for-design’, participatory making or infrastructuring, can equally be referred to as an unfinished or open design, as it allows use and appropriation of an infrastructure (makerspace) after its establishment. In particular, ‘design-in-use’

and appropriation or ‘design-after-design’ phases can be enhanced by seeing makerspaces as ‘spaces for infrastructuring (Seravalli 2012, 54)’. They offer potential for addressing a variety of participants, as the space can be reconfigured according to participants’ needs or use activities, because, ‘the ‘use’ that we simulate, create and invite as part of a design process, be it iterative or participatory, cannot deal with what it means for something to become someone’s, what it means for an object to become part of someone’s life’ (Redström 2006, 130).

### Acts of use becoming design

As mentioned above, in traditional PD, the design process is about envisioning ‘use before use’ (Redström, 2008), however, use is interpreted differently by the user and by the designer, especially when considering use and appropriation over time. This is particularly evident in alternative spaces of production, where a participant may act as a user but also as a designer. This informs our premise here, in which infrastructuring is considered as designed, not dissimilar to an unfinished object where the final use is ‘undetermined’ (Redström, 2008). Makerspaces as infrastructuring can be treated as ‘objects’ of design, in the sense evoked above, as dynamically structured processes that engage designers and users alike, independent of who they are, but in terms of how they use the object (in this case, the makerspace) beyond its original form (‘design-after-design’).

This premise expands our understanding of users, since infrastructuring enables extended forms of use, beyond making and designing objects towards facilitating makerspaces. Such use can also entail taking responsibility for its management and appropriation. The acts of use described here go beyond merely using something or some place, it can include becoming active participants, caring for a common space, supporting associated activities and values. Therefore, below, we differentiate among types of use, including extended forms of use, which are often lumped together. While

performing an act of use, a user is changing their role towards becoming an active designer. Dittrich et al. point out that this is an important issue for PD, as it highlights design for change and ‘brings into focus issues of coordination between use, design in use and adaptation and development’ (2002, 124). A user starts to change their role from passively enacting a pre-designed use towards changing an object and its use to better fit their current need. In this process, users develop their skills by actively creating ‘meanings that are so original that they become similar to designing’ (Bredies et al. 2010, 159). These patterns of use and appropriation of an environment (Telier 2011, 177) can be also interpreted as social practices, as they refer to the act of change. Through use, change is enacted and meaning is created by the user through active involvement (acts and activities). In our analysis, and recognizing that change in skills is learned over time, we distinguish among types of use.

For example, in the co-sewing café, first-time participants can ‘operate’ *non-specific* everyday tools such as a clothes iron or vacuum cleaner without instruction, but they may need to learn how to operate a *specific* tool, such as a sewing machine. Users increase their competence by learning how to thread a sewing machine, or one can already be knowledgeable about how to operate the tool. ‘Maintenance’ entails keeping an existing artifact/service/space in good condition, a special case of which is the sewing machines that are maintained by the first author and a participant called Mr. Kraft, who is a local expert on repair. Further use practices derived from Carroll (2004, 3) among others, include ‘adaptation’, ‘modification’, ‘tailoring’ and ‘redesign’, all aiming to close the gap between the intentions of the designer and the actual use. For example, a user may alter, adapt or redesign the appearance or function of an original design to better fit their needs. In the café case, the design may include the infrastructure of the space and tools, garment patterns, materials and clothes produced. An advanced extension of this is when participants may practice ‘appropriation’. Characterizing an act of taking possession of a thing

by making it one’s own, ‘appropriation involves mutual adaptation’ (Carroll 2004, 3), during which users may not only redesign but take over or take ownership of a design.

These types of use are summarized in Table 1, in which the two right-hand columns elucidate the types through instances from the case of the co-sewing café.

Type of Use Acts	Types of Stuff	Example
Operation	Non-specific everyday tool	Iron, Vacuum Cleaner
Maintenance	Specific sewing tool	Sewing Machine
Adaptation (Modification, Tailoring and Redesign)	Specific sewing tool	Sewing Materials (Fabrics etc.)
Appropriation	Infrastructuring Stuff	Patterns
Management	Infrastructure / Space	Key

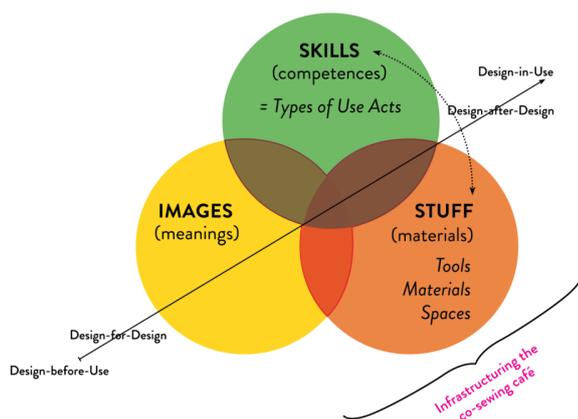
**Table 1: Types of use acts derived from literature. These types are elucidated through significant things (or ‘stuff’, see section 2.3) used in the co-sewing café, which have been derived from the first author’s observations, diary notes and photographs. [Click for larger image.]**

## Practices of use

In order to account for a more extended and evolving spectrum of acts of use and participation, our understanding is also informed by interpretations of ‘social practice theory’, which has entered into design research in various ways including through studies of PD and ‘living labs’ (Kuijer 2014). While considered as a kind of ‘micro’-sociology within the social sciences, social practice theory nonetheless considers larger and longer practices of consumption than typical in design research. Leading contemporary scholars in the field, Shove, Watson, Hand and Ingram, conduct research on D.I.Y. (do-it-yourself), in which ‘the application of skill, knowledge judgement and passion and results in the production of something made and designed by the same person’ (Shove et al. 2007, 42 referring to Campbell, 2005, 23). While primarily focused on social practices of consumption, their particular interest in D.I.Y. reveals consumption as a blurry category that may also include types of use and production at scales relevant to design research in general and to the

study presented here.

Further, practice theory pays particular attention to materiality as an intrinsic component of social practices. Following Kuijer's (2014) interpretation and development of practice theory in design research, we view the composition of social practices as the interrelation of three different components. Following other design researchers (Scott et al. 2011, Kuijer & de Jong 2012), we also adopt the following terminology of Shove and colleagues (e.g. Shove & Pantzar 2005, Shove et al. 2012) as analytic categories here: 'stuff' (materials), 'skills' (competences) and 'images' (meanings) (Figure 2). For our purpose, practice theory is useful in expanding the unit of analysis in design research to include larger and longer practices of participation (de Jong & Mazé 2017), including multiple, varied and changing practices of using space (co-sewing café), spatial arrangements including furniture, materials, tools (sewing machines and equipment), interaction with materials (fabrics, threads, etc.) and participants' skill-development.



**Figure 2: Representing the three interrelated components that shape and change use practices, part of the figure is adapted from Shove and Pantzar (2005). The figure combines this with elements from Fig 1, in order to express that use acts accumulate, extend and evolve over time as practices along a spectrum of use becoming design.**

Figure 2 draws together the main concepts that we have derived from literature to analyze use practices and infrastructuring in the case of the co-sewing café. In this paper, we focus primarily on 'skills' and 'stuff' as categories through which we analyze use of the café over time. Through these categories, we are able to articulate and analyze types of use (Table 1) and users (Table 2), thus addressing the first research question in this paper. Further, examining use and users in relation to stuff, and the evolution and interrelation of these over time, we address our main research question concerning the interrelation of participation and spatial-material aspects of infrastructuring over time.

## CASE - THE CO-SEWING CAFÉ

The 'co-sewing café' has been initiated and run by the first author with support from two colleagues (Stegen & Iran, c.f. Hirscher & Iran 2016), including designing the space, facilitating workshops, and acting as participating observer and documenter/photographer of the activities. As of January 2018, 42 workshops have been held, attended by 314 participants in total. The majority of participants are female, with ages ranging from 16 to 80, though most are between 30 and 60 years old. Each workshop had a varying number of participants ranging from 4 to 25, however, the average number (which fit comfortably in the space) was 6-8 participants. Of the average number of participants in a group, typically about half were regulars, and the others were first-timers or occasional participants.

### The co-sewing café as a makerspace

The café can be understood as a makerspace, which offers an open, collaborative workshop environment shaped by its individual participants and purpose (Kohtala & Bosque, 2014). Located in a small town in southern Germany with about 6600 inhabitants, it was established in July 2016 as part of a bigger research project, a 'Reallabor' (real life laboratory),

which investigated sustainable transformation of a rural context (Geiger, Hirscher & Müller 2017). The town has a history of textile manufacturing, however, today, much of the former factory spaces are unused and several revitalization projects have been initiated. The co-sewing café occupies a former 60 square-meter shopfront. It has been set up to contain 10-12 workstations, which include refurbished domestic sewing machines and donated sewing materials and fabric. During the research period, 3 hour-long workshops were offered 3 times a month over 18 months. Through garment design workshops, participants can develop their skills and competencies, learn to use the space and stuff, while designing and making their own garments. Each workshop provided sewing suggestions, such as garment patterns and examples to try on, accessible for different skill-levels, workshop facilitators provided support, advice and ideas for groups and individual participants.

In 2016, the project started with a first kick-off co-design session for more than 30 participants. From the start, the café was set up to attract and serve a diverse range of participants, in this way extending PD values to include the widest possible range of people and groups with differences in skill, representation and power (Keshavarz & Mazé 2013). To attract a greater diversity of participants, we visited the local refugee housing and a town-meeting, prior to the workshop, to introduce and discuss the basic concept. Thus, the purpose of the café surpasses that of producing garments but also enables learning and exchanging knowledge and skills, interaction and community-building among peers and various people with common interests.

## ANALYSIS

In section 2, we discussed the different approaches of design for, with and by the user and how this is relevant to design for infrastructuring. This was followed by defining different acts and types of use and use practices evident in the sewing café. As a result, Figure 1 illustrates the spectrum between use and design in alternative spaces of production. In

this section, we will elaborate how the different types of participation and use are linked to the type of user regarding their level of competence and the way the co-sewing café has been designed with the aim of enabling 'design-in-use' based on user appropriation of material and spatial elements. The aim is to clarify how, in the context of the café, specific socio-material and spatial conditions inform users' participation and acts of use, such as their redesign and appropriation of things for personalized use, which can be seen as becoming design through creating original meanings.

## Typology of user participation

Through analysis of participant lists and observations, we compiled a general perspective on the spectrum of use acts in relation to types of stuff. For example, the majority of the 314 participants already knew how to use everyday objects such as an iron, scissors and cleaning tools, and we characterize this competence level as *beginner*. However, and already when needing to pin patterns to fabric, only about 30 people dared to proceed much further on their own, and the majority asked for assistance. Likewise, sewing machines were only used independently by 35-40 participants who visited several times (*regulars*). Only are 5-8 engaged in maintenance activities, including our local repair expert who oiled machines, changed needles etc., and former seamstresses or our dressmaker, who we would more aptly characterize as *visiting experts*.

For those visiting for the first time (*beginners*, see Table 2), facilitators introduce the space and offer close assistance in choosing suitable fabrics, pattern-cutting and handling sewing machine. Already on their second visit, most participants independently start looking at examples of garments on display, start choosing fabrics and looking for patterns in their size. After 2-3 visits, participants often start supporting each other with advice on color choice, sewing tips, etc., depending on their skills. This way of learning to use the space, its tools and sewing processes emerges naturally

and is supported by the infrastructure, enabling a low threshold into the flow of activities, which is monitored and adjusted by the main author as facilitator, and some participants start who come very regularly. When participants start interacting naturally with the space, peers and community, they have started to personalized it to their own use. At this point, we refer to them as *regulars* (see Table 2). Regulars are a type of participant that are encouraged by facilitators to take action in planning and facilitating workshops for others. Thereby, regulars can transform into *active facilitators*, appropriating the space and taking the responsibility to assist and teach others. Of the 35-40 regulars, 7 have so far led workshops on their own. This account of types and changes of use illustrates how user roles are not fixed but can develop when supported by flexible infrastructuring. Initial and learned competences can evolve to the extent of participants becoming de facto managers of the café.

Table 2, thus, does not describe users per se but, rather, types of use activities and competencies that can develop over time and with practice (i.e. learning). Learning, in this context, refers not only to sewing skills and tool maintenance but use practices in which participants develop an understanding and skills related to the operation of the co-sewing café as a whole.

Types of Use Competence	Number of participants	Description
Beginners	314	Refers to people who come for the first time and those who can operate the basic tools and space. They may continue at this level or learn and improve their skills.
Regulars	» 40	Advanced users, for example those participating more than 3 times or on a regular basis who know how to use the space, independently operate machines, choose materials and use/adapt /create patterns.
Visiting Experts	5	Skilled locals, such as a former seamstress who assists occasionally or Mr. Kraft who repairs the sewing machines.
Active Facilitators	7	Active regular or very skilled participants who start offering to facilitate workshops, such as the dressmaker Naser (see 4.3).

**Table 2: Types of use in terms of level of competence, described in relation to typical ‘stuff’ in the café case. This table is derived from analysis of participant lists, diary notes and photographs. By ‘competence’, we refer to knowledge and know-how (as per ‘social practice theory’) manifested in use acts, skills and ability to use types of stuff (see Table 1**

**and Figure 2). [Click for larger image.]**

### Examples of emerging ‘stuff’

The next two subsections account for significant examples, which are extracted from longer, in-depth ‘rich descriptions’ from the analysis. In terms of significance, these examples articulate changing use over time and offer insight into evolving, emergent and unexpected correlations between skills and stuff. In particular, the examples below highlight how this generates new relations to existing stuff and even the introduction or creation of new stuff (i.e. infrastructuring).

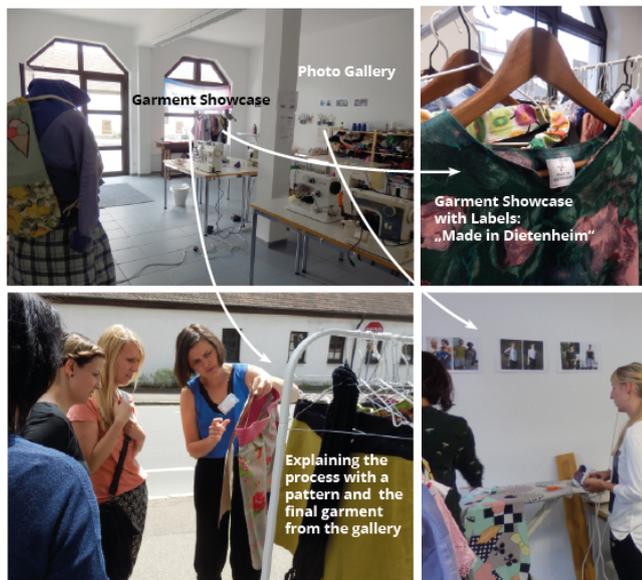
Relatively soon after establishing the café space and running several workshops, the first author recognized that different sewing machine models caused confusion and trouble for some beginners. In response, labels and instructions were designed and applied at each sewing machine. In addition, we labeled the different materials and made guidelines for pattern-use (Figure 3). These additions were aimed at enabling participants to personalize their use of the space, boosting their competence so that they could independently create their own meaningful experiences.



**Figure 3: Infrastructuring in the form of additional instructions for sewing machines and patterns.**

Furthermore, we started establishing a ‘showcase’ collection of garments, completed with ‘Made in Dienheim’ labels and a photo-gallery of those who made the garments. The labels were a simple way to mark participant attachment and meaning on their self-made garment (Hirscher 2013). The showcase and photo-gallery were initiated as a

response to this common question by locals: ‘What is a co-sewing café, and what do you do there?’. The showcase and gallery displayed garments (i.e. made and created stuff) of participants, even if the café was closed. The gallery also operated as source of inspiration for beginners, presenting the diversity of garments that could be made, for example with ‘upcycling’ techniques that were new to most locals. Through the showcase and gallery, a facilitator could explain to newcomers, for example demonstrating the theme of a workshop and the process from paper-pattern to ready-made garment, easing the entry level by showing manageable results.



**Figure 4: Infrastructuring in the form of garment showcase and photo gallery.**

### Examples of competent participants’ ‘stuff’

In addition to the examples above of stuff amended or added by facilitators, participants also redirected or initiated infrastructuring stuff. A notable example is Naser, a highly-skilled refugee from Afghanistan, who found in the co-sewing café a space to apply his professional knowledge by preparing upcycling designs and patterns to be copied, while assisting participants in garment making. With his existing

skills, he was immediately recognized as an ‘active facilitator’. Soon after, he asked for a key to access the space in order to offer additional opening hours for other participants to conduct garment repair. Even though his German-language skills were very limited at the beginning, he wanted to assist people with sewing. Thus, together, we prepared posters with translations of sewing terminology into three different languages (Figure 5).



**Figure 5: Infrastructuring in the form of a multilingual poster of sewing terminology to support Naser’s own workshop facilitation.**

Others with prior sewing knowledge participated in the space and workshops to benefit from the social setting or find inspiration. For instance, two experienced, local women participated very frequently, thereby developing a friendship and confidence to host their own workshops and to represent the co-sewing café at two local fairs. After hosting their own workshops, they felt that the space lacked rulers for cutting and pin cushions to enable a smoother working process. Thus, they brought self-made pin cushions and long wooden sticks marked as cutting rulers. They were personalizing the space for their own and others’ use. An even stronger commitment was evident when they took over responsibility for a shared key. A considerable development of use acts and competence is evident in this statement by one of them: ‘I would have never thought to make clothes for myself, I only did quilting for many years.’ The interrelation of regular participation, existing and emerging skills as well as the given and emerging stuff enabled a change in their competencies towards ‘active facilitators’.

There is one example of participation by a pre-existing group, a handcrafting club of local elders.

Their ‘group-leader’ mentioned that she had always been more of a ‘knitter, crochet person’ but wanted to use the co-sewing café to improve her sewing skills and give back by sharing her knitting and crochet skills. After participating in three sewing workshops, she thus offered to facilitate crochet-workshops on her own, for which several crochet hooks were added to the café stuff. One workshop focused on upcycling T-shirts, for which they removed the sewing machines and formed a circle of chairs; a second workshop, inspired by donated yarn, offered instruction in decorative lace-making (Figure 6).

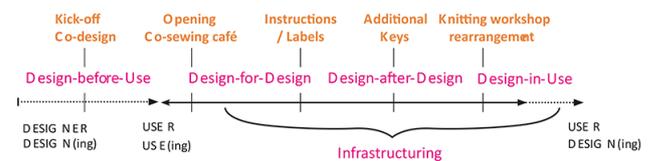


**Figure 6: Upcycling T-shirt and lace-making workshop facilitated by the local knitting club.**

In general, we can conclude that the more often people participate, their existing and learned skills can develop along with their self-confidence and social attachments. These can lead to redesign and appropriation of the facilities according to their own needs and community ambitions, which can range from identifying their preferred workstation and contributing additional tools to developing their own workshop themes and self-initiated and facilitated workshops. This illustrates that the co-sewing café is able to adapt to many types of use, enhancing participant’s competence and supporting learning, personal meaning-making and spatial personalization of the space and stuff.

These examples also articulate the difference in between types of use evident in a traditional PD

workshop from that of an alternative space of production such as a makerspace. While it is a space for many short and small workshops that may seem similar to those in PD, the co-sewing café also comprises long-term plans (both intentional and emergent) by its initiators and participants, including the ambition that the space is sustained and self-managed by participants after the research period. The cafe is thus closer to a commons-based peer-production spaces, in which participants use acts change not only toward making and designing own garments, but using, even (re)designing and managing the space itself, i.e. infrastructuring as ‘design-in-use’ (Figure 7).



**Figure 7: Events and significant stuff demonstrate the spectrum of types of use in the co-sewing café.**

### Articulating general types of participation

The analysis from which the above sections extract particular accounts and examples is summarized in Table 3 below. The structure of the table reveals how we have brought together categories and concepts derived both from literature and from empirical analysis.

In the table, categories from our conceptual model (Figure 2) such as ‘stuff’ are put in relation to acts of use (existing and learned ‘skills’ outlined in Table 1) and use/user types or competence (Table 2). While the Table 2 above includes a large number of participants characterizing a ‘beginner’ type of use, this Table 3 provides a more detailed account of the variety of stuff and skills involved. Through this account, we are able to make visible the more common types of participation in the café, including the necessary socio-material conditions and sources supporting general, everyday use by the majority.

Through Table 3, infrastructuring can be understood to span the stuff intended and planned from the start to the evolving, emerging and unexpected stuff related to significant use acts. As a kind of inventory of all stuff over time, it also reveals notable change use practice (Figure 2) and the importance of a few particular types of use/user competences. Including stuff created, donated or requested, we emphasize infrastructuring as activity emergent from the socio-material and spatial practices of all those involved (including initiators and participants of many types and competences).

Stuff	Skills	Skills	Source
Types of Tools	Use/User Competence	Use Acts	Who brought/made
<b>Non-specific</b>			
Scissors	Beginners	Operation	Donations by former seamstress and Mr. Kraft (visiting experts)
Needles			
Pins			
Pin cushions			
Iron and ironing board	Beginners	Operation	Donations by different participants (regulars)
Trash bins, broom and vacuum cleaner	Beginners	Operation	Purchased Donation
Multiple plug socket	Facilitators	Operation	Purchased
Ruler	Beginners	Adaptation and Operation	Brought by regulars, measurement was made together (see section 4.3)
<b>Specific</b>			
12 sewing machines	Regulars	Maintenance Operation Appropriation	4 sewing machines purchased, thereafter donations from locals and Mr. Kraft (visiting experts), currently 12 machines
Crochet hooks	Regulars	Operation	Purchased for the workshop hosted by the knitting circle (see section 4.3)
Oil can	Facilitators Experts	Maintenance	Mr. Kraft made a special tool (see section 4.4)
Chalk and measuring tape	Regulars	Adaptation	Donated, sponsored by local firm
Patterns and paper	Regulars	Adaptation Appropriation	Self-designed, donated or open source patterns, provided by the facilitators or brought by participants (active facilitators)
2 dress forms/mannequins	Regulars	Adaptation Appropriation	Donated
<b>Materials</b>			
Fabric of different colors and materials	Beginners and Regulars	Adaptation	Donated
Thread of different colors	Beginners and Regulars	Adaptation	Donated
Buttons, zippers, ribbons, rubber, clips	Beginners and Regulars	Adaptation	Donated
<b>Spatial arrangement</b>			
Furniture	Beginners and Regulars	Adaptation Appropriation	Donated Purchased
Space	Beginners and Regulars	Adaptation Appropriation	Rented
<b>Emerging stuff</b>			
Sample pieces, Example garments	Beginners Regulars Experts	Appropriation	Facilitators or experts create them before the workshops (usually 2-3 per workshop)
Produced garments, Garment showcase	Beginners Regulars Experts	Appropriation	Facilitators (see section 4.2)
Photo gallery, photographs of participants with their garments	Beginners Regulars Experts	Appropriation	Facilitatory photograph each garment produced (see section 4.2)
Posters	Beginners Regulars Experts	Operation Adaptation	Facilitators, including poster with multi-language sewing terms (see section 4.2)
Instructions (for materials and machines)	Beginners Regulars	Adaptation Appropriation Maintenance	Facilitators, created for more independent use (see section 4.2)
Labels: Made in Dietzenheim	Beginners Regulars Experts	Appropriation	Facilitators (see section 4.2)
Stamp: Made in Dietzenheim	Beginners Regulars Experts	Appropriation	Created by one of the facilitators with a participant
3-4 Keys	Beginners Regulars Experts	Management	Landlord provides on demand of facilitators

**Table 3: Summary of analysis shows the theoretically-derived categories in relation to empirical findings. [Click for larger image.]**

Table 3 provides insight on the space and stuff provided as well as development of users and their interactions with stuff, which, in turn, impacts the space and its stuff in time. It illustrates that non-specific tools can be used from the beginning – these do not require an extensive learning process and may not foster longer-term engagement or active participation. In comparison, specific sewing tools require stronger engagement to understand their functionality, and thus learning takes place, even by experienced sewers, thereby changing their level of competence (type of use). The competencies participants gain by using different types of stuff, engaging in processes with stuff and with others, can enable them to work more independently, potentially developing from those needing instruction labels and facilitator assistance to experienced and knowledgeable regulars (Figure 8). Users' potential redesign, adaptation and appropriation process can be signaled early, for example in the act of choosing a preferred sewing machine, adjusting personal space and, from this personalized basis, creating own garments. Such acts of use can be observed already during a third or fourth visit, when participants start asking for a specific sewing machine they have worked with successfully before. Regulars know the machines and space, and they may dare to give assistance to newcomers, thereby applying their learned stuff-related competences to develop their social competence as facilitators.



**Figure 8: A regular participant assists a beginner in using a sewing machine, supported by one of the facilitators.**

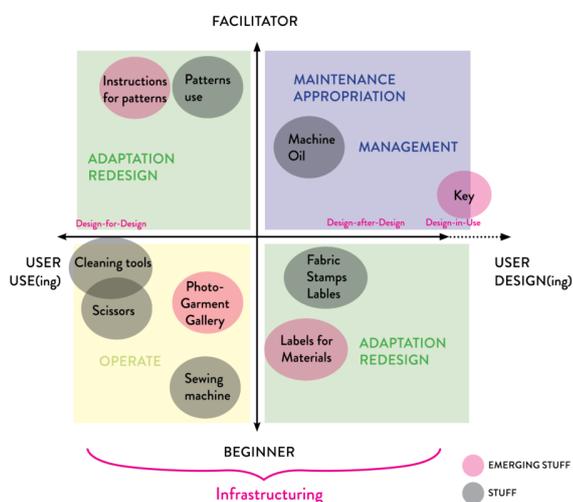
In the 'specific tools' category, the oil can is significant as a particular tool created by local repair expert Mr. Kraft to oil the sewing machine parts. The machines must be oiled, but only by applying very small amount of oil. To enable others to perform the use act of oiling, Mr. Kraft made an oil-can with a small needle opening that only allows drops of oil to emerge. The oil can is a tool that represents the importance of local experts without whom the co-sewing café would not run as smoothly. These experts provide expertise, donations and, in the case of Mr. Kraft, the oil can tool as well as sewing machine repair at no cost. We refer to him as a *visiting expert* that participates with his own high-level of prior knowledge and expertise in conjunction with his strong experience and knowledge of the café space itself, both of which enable him to design perfectly adapted tools.

The categories 'materials' and 'spatial arrangement' do generally address both beginners and regulars, but still show learning, as associated stuff addresses users' individual abilities and choice of engagement. On one hand, they can follow suggestions of fabric, thread and spatial arrangement suggested by others, on the other hand, they can make their own personalized combination. This type of stuff, which is evident in most makerspaces as noted by Seravalli (2012), enables 'design-for-design' – tools and spaces that allow users to create own design objects such as garments.

The stuff specifically designed for and with the participants, such as the showcase and labels, illustrates that while running a makerspace with the basic tools 'designed-for-design', there can still emerge design opportunities. Participants can ask or simply start adapting to the flexible needs or competencies of themselves and others, sometimes to promote their own engagement with the stuff and the space. Infrastructuring leaves space open for

participants to design, and the spectrum between user and designer renegotiated.

The key plays a very unique role, as it relates to a use act signifying taking on management activities. The key enables independent access for participants to use and facilitate activities in the space, and it comes with a quasi-legal responsibility for securing space. We came to consider this as part of infrastructuring when Naser asked for a key and, thereafter, we provided an additional key for more facilitators. Infrastructuring addresses matters of flexibility, while for us this refers to ‘design for future use,’ or use beyond project time towards sustaining a community of participants. Participants’ use of the key to run their own workshops represents the strongest level of competence and attachment to the space thus far. This level of competence shows the potential for the co-sewing café to be self-managed beyond project time, through which ‘design-in-use’ or ‘design-after-design’ would be reached through infrastructuring by many in the community over time. These findings are illustrated in Figure 9 below, which portrays the spectrum of use acts in relation to levels of existing/learned competences in relation to significant types of stuff. The figure also indicates the most advanced type and level of participation, i.e. management of the space and infrastructuring processes.



**Figure 9: Illustration of correlation between use types, stuff used and design/use spectrum.**

## DISCUSSION AND CONCLUSIONS

This paper brings together theories from multiple research fields (peer production, PD and social practice theory), forming a conceptual framework to articulate and analyze use and participation in an alternative space of production, i.e. the co-sewing café. While research focusing on user roles tends to remain preoccupied with individual identities and demographics, framing participation in terms of acts of use enables articulation of more nuanced types and changes (including learning) along a more fluid spectrum of activity spanning between design and use. Drawing in social practice theory allows us to explicitly account for the materiality through which infrastructuring takes place. Thus, infrastructuring is argued as a bridging concept across research fields to address use and participation at different scales spanning from traditional PD to alternative spaces of production such as Fab Labs and makerspaces, which are characterized by larger and longer socio-material practices. Our elaborated categorization (Table 3) offers a contribution to research on such spaces, since research to date has only touched upon socio-material influences upon user roles and transformation. A notable exception is the analysis by Toombs, Bardzell and Bardzell (2014) of tools as indicators in the development of a “maker identity,” although our analysis is even more extensive regarding types of stuff and use.

Figure 2 represents our conceptual model that combines concepts from multiple research fields, relating stuff and skills along a spectrum of use practices that may change over time. Practically, this model resulting from literature analysis is also a framework through which the extensive empirical material on the co-sewing café can be analyzed and discussed. Thus, the model may articulate a broad and robust framework that can also be applied in the detailed analysis, with potential for directly

impacting forthcoming choices in the development of the café. With the model, we aim to contribute thus both to multidisciplinary theory-building and to the practices of ourselves and others working with alternative spaces of production.

In the tradition of ‘research through design’, practical and the empirical analysis have also sharpened, influenced and shaped our theorization of key concepts drawn from literature. Tracing our evolving understandings of participation in literature and case analysis, the illustrative figures throughout the paper articulate different dimensions in relation to one another and in relation to the empirical analysis presented in the form of Table 3. Drawing together key dimensions derived from the literature and empirical analyses, Table 3 directly addresses the research question in its form and content. The analysis of the table illustrated that within the co-sewing café, evident types of participation are identified and manifested through the personal use practices and the frequency of participation. The types of use in reference to the type of stuff provide insight on the level of skills and engagement of the participant and the roles they assume to or change over time. These types of participation can be understood and articulated in relation to the way they use or interact with the space, its tools, materials and infrastructuring ‘stuff’, making the co-sewing café their personalized own. Through our change-model, supported with detailed reflections on key-events, we could illustrate these interrelated change mechanisms building on learning over time. We propose that acts of participation can be understood as types of users building on their level of competences. These different types of users may change their role, and acts of use towards stronger or weaker types of participation, impacting the co-sewing cafés socio-material and spatial conditions.

The role of the designer is seen in this context as enabling a fluid infrastructure that attunes to a spectrum of possible participation – designing for infrastructuring. Significant extracted examples, conveyed here through anecdotes, such as that of the physical key to the café, bring to life the overarching aim of the café of enabling personalized

and sustained use beyond project time, fostering “design-in-use” or “design-after-design”. Seravalli (2012) and Toxler (2010) have pointed out a particular challenge of long-term sustainability of physical makerspaces with regard to common struggles with continuous participation. Ultimately, the future self-management and sustainability of the café is a subject for further research, in which findings from this paper may be applied, including learnings about how infrastructuring enables changes in space and participation over time.

We are aware that this research has also certain limitations. Within the scope of the paper, it has not been possible to provide depth accounts (including some theoretical inconsistencies and potential contradictions) of concepts within and across multiple fields and disciplines. Our framing of key concepts and the conceptual framework are thus open for further development, testing and iteration. Likewise, the extent of empirical material offers the possibility for deeper analysis regarding some quantitative and temporal aspects. These and other issues, including further analysis of the interviews, will be reported in future publications.

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