DRAWING TOGETHER

INFRASTRUCTURING AND POLITICS
FOR PARTICIPATORY DESIGN

a visual collection of cases, issues, questions,
and relevant literature

Edited by Andrea Botero ——— Helena Karasti
Joanna Saad-Sulonen ——— Hanne Cecilie Geirbo ——— Karen S. Baker
Elena Parmiggiani ——— Sanna Marttila

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TOGETHER

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DRAWING
TOGETHER

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A WORKSHOP ON INFRASTRUCTURING IN PD

This e-zine documents the discussions and group work done at the 'Infrastructuring in Participatory Design' workshop, a full-day event that took place at the Participatory Design Conference 2018 in Hasselt and Genk, Belgium[1]. The workshop invited the Participatory Design (PD) community to come together, with their cases or projects, questions and topics of interest in order to take stock of empirical insights and conceptual developments around the notions of infrastructure and infrastructuring, and their relevance to the revitalization of the political agenda of PD. Following a hands-on approach, participants - collectively and critically - mapped issues, disentangled assumptions, identified blind spots, and outlined new research opportunities charting the possibilities and limitations of an infrastructuring approach in Participatory Design at large.

Participants at the workshop came from a broad range of domains (e.g. Design, Science and Technology Studies, Anthropology, Social Sciences, Information Sciences, Architecture), representing interests in infrastructuring from multiple perspectives. Prior to the workshop, participants were asked to 1) write a position statement and read everyone else's position statements, 2) look at their own work in relation to the theme of the workshop to pick one artifact to bring to the workshop, 3) contribute to a collective compilation of research literature dealing with infrastructures and infrastructuring. With these activities, we together prepared issues, ideas, and concerns to work with in the workshop. ▶
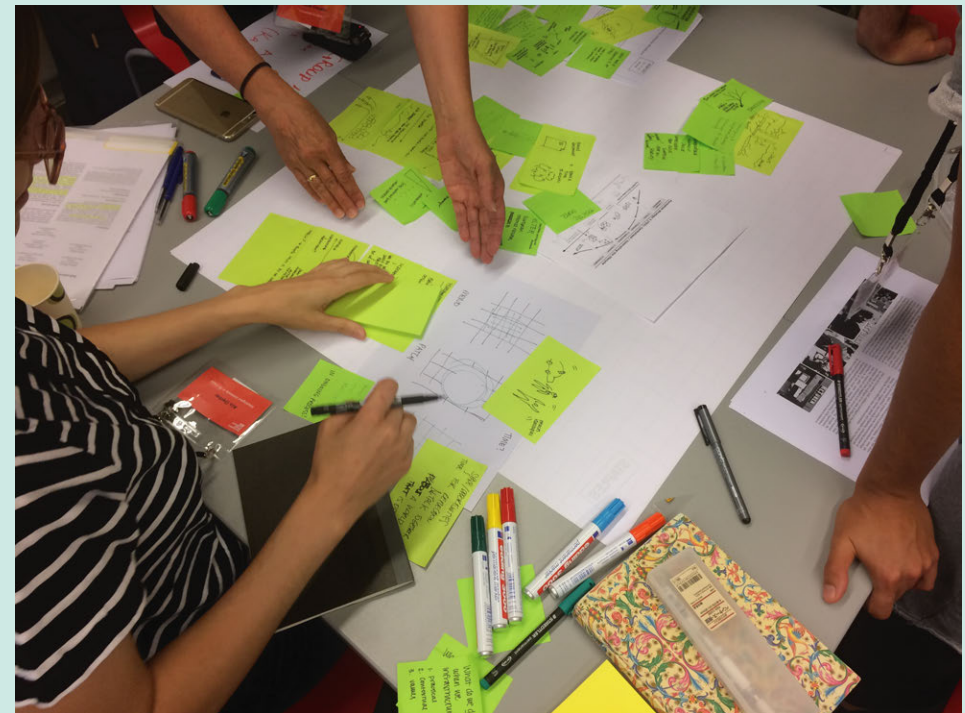
[1] For the framing of the workshop invitation see: Karasti, H., Botero, A., Parmiggiani, E., Baker, K., Marttila, S., Saad-Sulonen, J., & Geirbo, H. C. (2018). Infrastructuring in PD: What Does Infrastructuring Look Like? When Does It Look Like That? In Proceedings of the 15th Participatory Design Conference - Volume 2 (pp. 45:1–45:3). New York, NY, USA: ACM. https://doi.org/10.1145/3210604.3210618

The day of the workshop started with a brief introduction by the organizers to set up the agenda for the day. As a starting point for the collective effort, we proposed to think about "What does infrastructuring look like?" and following Star and Ruhleder[2], we also asked "When does it look like that?". To gather the different threads, during the event and also in this publication, we rely on Latour's invitation to "draw together"[3]. That is to, literally and speculatively, identify, trace and propose some of the elements, conflicting positions and promising paths we can see towards a better understanding of the work infrastructuring might do for participatory design and politics and vice versa.

In practice, participants worked in four small groups in a series of four consecutive sessions. Each session was formed around discussions centered on an exercise or a set of questions that helped participants present their insights to each other, while jointly creating a collage board using physical artifacts such as post-its, string, straws, and such. When briefed about the approach to making this particular collage board, we asked participants to think on the picture walls and visualizations that have become famous in media depictions of detective and forensic work[4]. Participants used their cases, ideas, questions and the literature to build interrelations and discuss issues; while addressing the varied understandings of infrastructuring approaches that exist. The collage boards were documented (with pictures) and collectively discussed at several points during the day. Each of the sessions added a layer on top of the previous layer.

After completing each layer, the groups' brief presentations were recorded and later transcribed during the post-production of this e-zine. We also asked participants to fill in a very short online feedback questionnaire after the event.

[2] This relational view of infrastructure was first articulated in: Star, S. L., & Ruhleder, K. (1996). Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces. Information Systems Research, 7, 111–134

[3] In 2008 Latour said: "Let me raise the question of design, taken literally in the etymological sense of drawing or rather of "drawing together". How can we draw together matters of concern so as to offer to political disputes an overview, or at least a view, of the difficulties that will entangle us every time we must modify the practical details of our material existence?" Latour, B. (2008, September). A Cautious Prometheus? A Few Steps Toward a Philosophy of Design (with Special Attention to Peter Sloterdijk). Keynote lecture presented at the Networks of Design Conference-Design History Society, Falmouth, Cornwall. (pg 12) Available: http://www.bruno-latour.fr/node/69.

[4] For a short overview of how forensic walls have been appropriated in popular culture see: Benson, R. (2015, January 23). Decoding The Detective's "Crazy Wall." Available at: http://www.esquire.co.uk/culture/film/news/a7703/detective-show-crazy-walls/

Each of the collage boards contains four layers that are listed here, and described at more length in the next sections of the e-zine:

LAYER 1:
Cases and positions

LAYER 2:
Collective issues:
The what and when of infrastructuring

LAYER 3:
(Re)problematizing politics, participation and infrastructuring

LAYER 4:
Uncharted territories: some research paths

The text for layers 2-4 is based on the audio recordings that we collected from each groups' presentations at the end of the session. The text is not, however, a verbatim transcription as some editing has been carried out in order to improve the readability of the text.

The collection of all these materials forms the backbone of this e-zine. Our aim is to document, present and redraw the discussions in a visual way, illustrating the multiple paths of exploration for future readers, while providing some resources in the form of questions, ideas and references. The e-zine does not provide recipes, solutions or answers. Rather, it offers a collective documentation of topical issues raised by workshop participants engaged in the politics of infrastructuring.
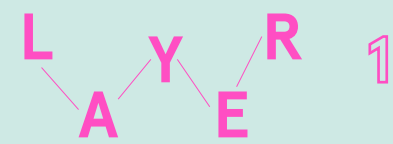
LAYER 1

Cases and positions

LAYER 1:
CASES AND POSITIONS

GROUP 1:

Hanne Cecilie Geirbo brought to the workshop a photo of a DIY air quality sensor that is part of a European air quality monitoring project that engages citizens in their infrastructuring. She wanted to discuss what the analytical purchase of 'infrastructuring' is, and how this differs between disciplinary communities.

Christine Hegel brought a reusable bottle to discuss her interest in infrastructuring in the Informal Micro-hauling Labor Market in NYC. She is exploring how formal actors in the recycling business can participate in designing infrastructure as part of cultivating greater recognition and valuation of the informal laborers in this business.

Joanna Saad-Sulonen brought a picture of a note-to-self written by a civil servant working at a Finnish research station and a picture of a diagram from the European Strategy Forum on Research Infrastructures public roadmap 2018 guide. She used them to ask how to study (and engage in) infrastructuring in general and the politics of infrastructuring in particular. What can a "PD approach" bring to such inquiries? What are the limitations of this term/concept/construct (e.g. is it becoming too fuzzy and all-inclusive)?

Laura Scheepmaker brought a photograph of a play-thing in the form of pads that make sounds when they are stepped upon by children playing. She is interested in infrastructuring as a way to help her explore roles for interactive technologies to scaffold social play between children with diverse abilities.

Participants:
Hanne Cecilie Geirbo,
Christine Hegel,
Joanna Saad Sulonen,
Laura Scheepmaker

GROUP 2:

Participants:
Karen Baker,
Andrea Botero,
Cathrine Seidelin,
Jesper Simonsen

Karen S. Baker brought with her a printed diagram depicting local / remote data configurations for data sharing in the environmental sciences. She wanted to bring forward her interest in infrastructuring and in making visible local data management in this area.

Andrea Botero brought various office supplies (pens, tape, thread, etc) to question if these are mobilized as infrastructuring, when for example they are used in workshops with scientists trying to understand their research infrastructures.

Cathrine Seidelin showed a photograph of a workshop she organized where participants brought data objects they dealt with (the photograph was digital, therefore we included a quick sketch of it in the collage). She wanted to discuss if, and when, data can be considered as Infrastructure and how to do infrastructuring for Data Analytics.

Jesper Simonsen brought a collection of pictures from two hospital settings. The photographs featured an interactive board solution located in two different environments. In one it was incorporated into local practices while in the other it was detached and not so much used. In the second case users compensated by making local adaptations with a non-digital board. These examples illustrate challenges of local infrastructuring in Healthcare information systems.

GROUP 3:

Sanna Marttila brought some images and a brochure of the hack4-fi hackathon event she has been organizing around cultural heritage. She wanted to ask: "Can we collaboratively design socio-material-technical infrastructures in more collective, open and symmetrical terms? What are the tensions and dynamics of the becoming and making of an infrastructure and infrastructural change?"

Elena Parmiggiani shared a web page printout of a Norwegian newspaper, with a picture of two representatives from an oil company presenting a new real-time web portal for fish tracking to the local fishermen communities. Through it she wanted to ask "What does it mean to study the politics of infrastructure/-ing, and what does this mean for participation? How can we draw concrete implications from the study of politics?"

Mette-Agger Eriksen brought a series of black and white images and drawings of a session from a workshop discussing the future of libraries. She wanted to raise issues relating to the politics of infrastructuring for (mutual) learning, particularly what are the roles and participation of non-human actors/materials in this? And how do these non-human actors enhance or challenge learning and change to happen?

Christopher Frauenberger brought a picture of the half-house project by R Aravena in Chile. He wanted to use it as a prompt to ask how to build half-houses for play situations. He is exploring roles for interactive technologies to scaffold social play between children with diverse abilities. Can infrastructures provide opportunities to effectively blur design and use times, i.e. provide opportunities to extend participation in design after the designers are gone?

Amanda Geppert shared a project board illustrating a five-week participatory design workshop process wherein young people redesigned sexual and reproductive health care to be adolescent-centered. The prototypes young people made responded to 'glitches'(moments when sexual and reproductive healthcare

Participants:
Mette-Agger Eriksen, Christopher Frauenberger, Amanda Geppert, Sanna Marttila, Elena Parmiggiani

doesn't work for young people[5]) as signals for transformation wherein participatory design research worked towards infrastructuring equity.

[5] The notion of glitches is taken from: Berlant, L. (2016). The commons: Infrastructures for troubling times 2016. Environment and Planning D: Society and Space, 34(3), 393-419.

DRAWING TOGETHER: INFRASTRUCTURING AND POLITICS FOR PARTICIPATORY DESIGN

GROUP 4:

In the workshop Alix Gerber drew the three figures of a mend, a patch and a weave that she had introduced in her position paper. Relating the figures with her empirical example of reimagining policing in Ferguson, she discussed how incremental (mending) and radical (weaving) change can influence each other over time and how an ongoing infrastructuring timeline proposes challenges with participation over time.

Helena Karasti brought pictorial representations of research infrastructure formation in Europe. Two panels illustrated the European level, top-down organised ESFRI strategy, and a national level with no fixed strategy. Through this juxtaposing, she talked to some of the politics involved between the high-level infrastructure building view and the local/national infrastructuring view of meeting top-down expectations.

Giacomo Poderi introduced a metaphor of a rhizome that draws from the theorizing by Deleuze and Guattari. The metaphor evokes thinking about the underground sprouts, unpredictable and randomly emerging connections that nevertheless form into something more solid and coherent. This double dimension of randomly emerging and yet managing to build stability into a trajectory of growth reminds us of infrastructuring. The metaphor also speaks to the complexities involved, for example, entanglements of people and interests in infrastructuring.

Anna Seravalli shared an artifact, a written contract document considered as a product of participatory design/infrastructuring project within the public sector in Sweden. She used the co-production agreement to talk about politics, different levels of learning and participation of different groups in a project that dealt with waste handling.

Participants:
Alix Gerber,
Helena Karasti, Giacomo
Poderi, Anna Seravalli.

LAYER 2

Collective Issues:
The what and when
of infrastructuring.

LAYER 2:
COLLECTIVE ISSUES: THE WHAT AND WHEN OF INFRASTRUCTURING

The second session was organized as discussions within each of the four groups with focus on drawing connections between the artifacts and issues presented earlier in the group. Each group first identified areas of interest that relate to infrastructuring and then searched for connections, differences, tensions and similarities between the presented cases/artifacts and identified topic areas of interest. Threads of wool were used to make connections (so they could be moved) amongst the cases laid out in the previous session. White tags were provided to annotate the connections. Some of the threads not only connected artifacts but came together to form a topic (area).

SEEDS AND SEEDING:
Interventions and making the strange familiar (Group 1)
Hanne Cecilie Geirbo, Christine Hegel, Joanna Saad Sulonen, Laura Scheepmaker

We discussed several themes based on our cases. Laura's case is about doing participatory design with schoolchildren with disabilities to make playthings, and how a PD process can be integrated with the school as infrastructure. Christine's case concerns the relation between the informal and the formal in the infrastructuring of can recycling in New York. Hanne Cecilie talked about the infrastructuring of the environment through a project where citizens are invited to build DIY sensors and contribute with data about air quality from their homes. Joanna's case puts in parallel the local, personal, and caring associated with research infrastructures as seen, for instance, in research stations versus in the top-down bureaucratic approaches of the EU. In our board, time and money are featured as the group talked about funding, internal resources, and interventions. Seeding became very important in the discussion and was used as a metaphor, as a theme. Why? Because for interventions you need to prepare, you have to deal with a lot of external

elements like corruption or political structures and you either try to fit in your project or you need to change the existing structures for a successful intervention. In that sense, all the projects talked about an intervention, but sometimes that intervention was kind of coming from within, it was sort of internally arising, some sort of disruption from within, a broader infrastructure. And in other cases, it was coming from outside, externally operating on top of it or seeking to operate on top of it. These were the instances or moments in which there were things that seemed to be seeds. They were getting planted in the soil, and they created certain kinds of potentialities for something to happen. The idea of seeding seemed to us as almost another way of talking about infrastructuring, and how this may be fruitful. We used a lot of botanical metaphors! The cases discussed also featured processes or possibilities for making things strange or making them familiar, transformative kinds of interventions that were acted on and played a role in infrastructuring. We talked about them in the sense of intervention, how can we, as PD practitioners, intervene by opening up these moments?

DATA, GATEWAYS, GLOBAL/LOCAL, AND A RESEARCH AGENDA
(Group 2) Karen S. Baker, Andrea Botero, Cathrine Seidelin, Jesper Simonsen

We had a wonderful set of relations in the discussion, starting from presenting our perceptions and ending things with more ontological discussions of what is actually an information infrastructure and are we, that is people, part of the information infrastructure at the moment we interact with it? Are users part of it? We started with Cathrine's case in the education sector; she proposed data as infrastructure. How, large amounts of data available now for analytics could be seen as infrastructure in itself. Data thus became an area of the board as it was a big issue. Data also connects later on to knowledge-making, where we had a side discussion about a research agenda for the PD community: when we do our work and how to get it out of the lab? and try to make impact? This is of course connected to the political dimension. Jesper's case is from the healthcare environment and relates to local infrastructuring. You have these kind of top-down global, technical infrastructures (he did not dare to say just infrastructu-

res but technical infrastructures). In order to adapt them and make them work, there's something locally happening that either facilitates the There are research field sites that have their local ways of handling data, and then there are these more remote repositories or archives to which they would like to submit their data. This brings up the need for some sort of local data person, a data specialist to handle work with data as a kind of gateway. This is comparable to the situation in Jesper's case where there is a need for a local data specialist that establishes and keeps the local-remote gateway open so to speak. That is why we have the local versus the remote, which came up in three of our cases. We also had a deviant case (because it didn't relate to data) with Andrea thinking of office supplies as infrastructure to build collaboration in a specific instance. This case brought us to consider the issue of tiny infrastructure. We were wondering if infrastructure studies as they started with a very large scale, are now also providing insights
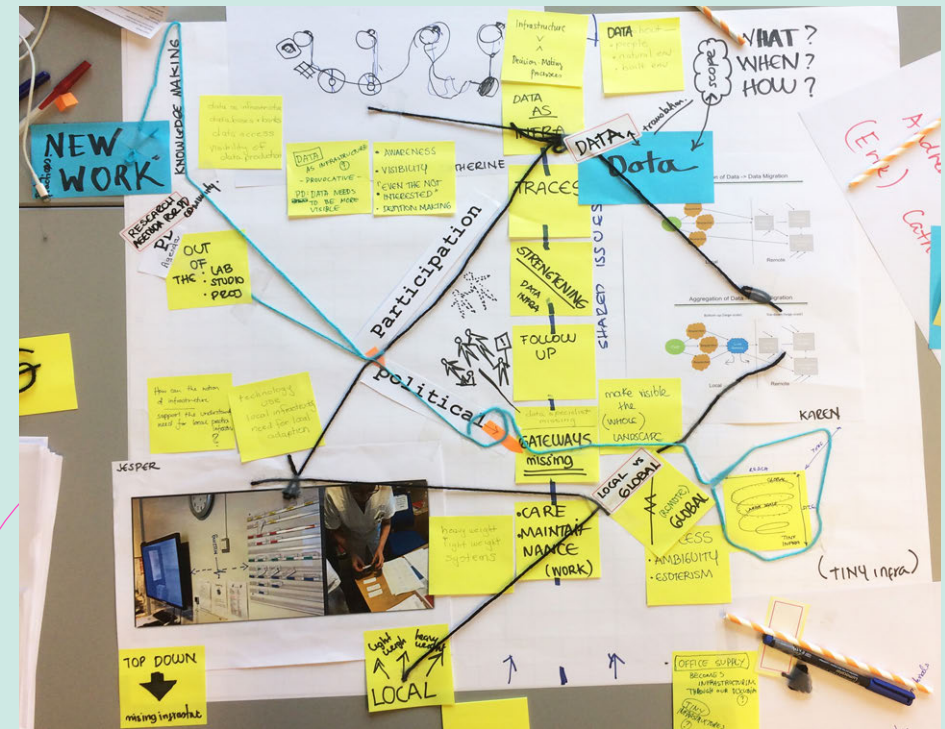
into the very tiny, but still relational aspects of local instances of infrastructuring, that connect somehow to the more local, connected? We had a very interesting discussion about the notion of Karen's work with data and how gateways in discussions of infrastructure arrangements are often missing, and how considering gateways as people brings in this whole PD perspective that people (and practices) are necessary. That is, even though we develop these technical infrastructures we cannot simply avoid people and gateways. This in turn relates to the political aspects of how do we increase participation. Aspects of data and especially gateways, are not only a missing element, they are blind spots. There's a lot not known about data in different environments e.g in healthcare or environmental arenas or educational venues). At the same time, in these different arenas, that's where PD really has something to offer.

RECONFIGURING, LEARNING, (COUNTER)NARRATING, KNOTWORKING, STRUGGLING (Group 3)
Mette-Agger Eriksen, Christopher Frauenberger, Amanda Geppert, Sanna Marttila, Elena Parmiggiani

The discussion was a productive reflection on the meaning of politics and infrastructuring. The themes and particularly the objects presented by the participants varied significantly. Christopher presented a picture from the so-called half-house project in Chile, where half houses were built by a famous architect to elicit reconstruction in the aftermath of an earthquake. Mette and Amanda subsequently presented images from collaborative workshop sessions. In the case of Mette, it was an image taken from a participatory workshop to discuss the future of libraries in Denmark, while Amanda showed a board from a project, including pictures of objects designed to remind young adults to use healthcare services to prevent sexually transmitted diseases. We debated the possibilities for situated interventions in the case of e.g low-income areas and also the politics associated with race in particular in the USA.

Elena presented a web page, with an article describing a workshop where a Norwegian oil company presented an open data portal for environmental monitoring to a community of fisher-men. This triggered a discussion on the broader meaning of politics on the global level. Finally, With Sanna's brochure from a hackathon event she has been organizing around cultural heritage, we looked at what are the tensions and dynamics of the becoming and making of an infrastructure and infrastructu-ral change. Like the previous group we also had quite a lot of ontological troubles in our discussions to the point where we almost lost our subject. We came to the point of asking what is infrastructure? Is it really something, or is not everything infrastructure? Here it became a bit silly. We tried to go back and think what it is that we do when we say we're infrastructuring things. The best verb that described our activities was to say we reconfigure networks. This is the highest pillar in our board. it's important to say here that when we say we reconfigure things, that these things can be... of different kinds. We configure relationships between humans, we configure relationships between non-human actors and that's where more material infrastructure comes in; however infras-tructure can be everything and nothing. By reconfiguring the relationships within networks we make different activities possible. Something is configured in a way that certain acti-vities are more likely to happen than others. PD interventions aim to reconfigure these networks so that other activities not only become possible but also likely. On the board we have also other lower pillars labelled with topics. In one, we talked a little bit about counter-narrating or the narrating what we do, because part of the reconfiguring of networks could also be just changing the story about something. Even just changing the narrative about an infrastructure is an infrastructuring activity. Changing is an intervention. So what pieces or which actors do we connect and how do we build these relationships, or the network, to have a different, or offer a different opportunity space for activities. Another pillar is, what kind of learning is happening in these networ-ks? In almost all cases we talked about learning as an impor-tant aspect of the participation. The creation of knowledge and the learning that leads up to that knowledge re-configures what is possible to do within a given socio-technical or
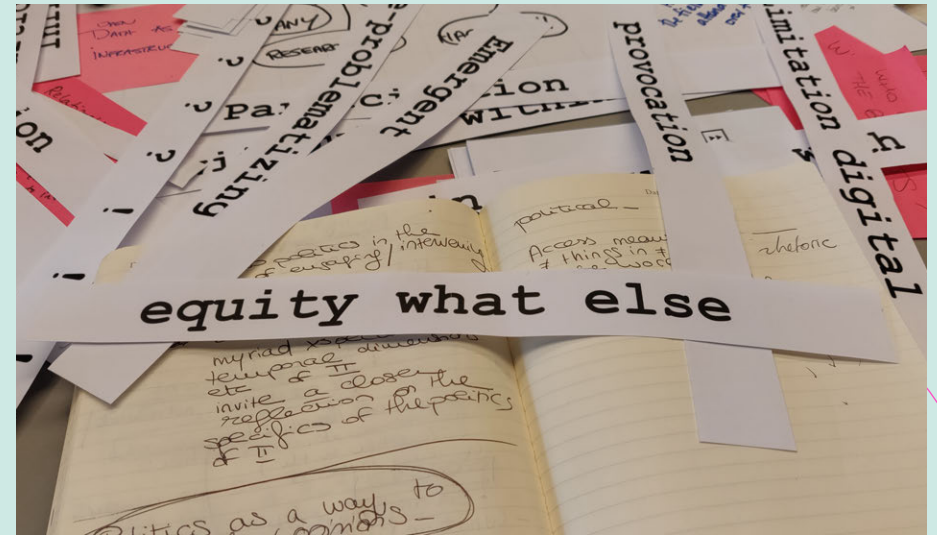
certain material network. Our group had cases of varying poli-tical urgency, some were very politicized, some were maybe less so, but it's also a case of when we reconfigure, how do we talk about, how do we motivate this reconfiguration? How do we justify that we want to reconfigure that situation? This always has something to do with political (agendas), with debates, with agonism, with struggle. And when we say we infrastructure, then we need to be transparent about how we motivate that change or reconfiguration. This was also rematerializing, sometimes that reconfiguration is not just a story or not just the people but it's also materials ordering the possible acti-vities within the network. Sometimes it is the material thing that changes what is on offer. And lastly we thought of when and what? That is the seventh sticker on our board, a sort of meta-comment because it's halfway between everything. With the question "when does infrastructuring happen", we all agreed that it is actually all the time. One important aspect of infrastructuring is that it quite effectively blurs the boun-dary between design and use time. Because design time is time when you infrastructure. But when you've done with that infras-tructuring, well, the participation in design extends into the use time.

AGREEMENTS, LEARNING, SCALES OF INTERVENTION AND POWER (Group 4)
Alix Gerber, Helena Karasti, Giacomo Poderi, Anna Seravalli

We had three cases and one metaphor. One of the three cases, brought by Alix was dealing with policing, infrastructuring for changing the practices of the police and of policing. The second one on infrastructuring around research infrastructures in the environmental sciences was introduced by Helena. The third case was on infrastructures of waste handling presented by Anna. The metaphor was Giacomo's contribution, with the idea that the rhizome can be seen as a way to understand infrastructuring. For those who don't know what a rhizome is, it's how some plants operate: so you have a small thing that stays under the ground and grows a little bit randomly or emergently and sometimes it becomes a plant and sometimes it just dies. Out of those cases we started to discuss how the different ideas resonate. The cases were quite complex but we have identified three salient issues: agreements, learning and scales of intervention. The first salient point that we noticed in all these cases was the role of agreements or documents and the role of materialisations, a bit like group number three was talking about. Both in terms of being a key aspect of infrastructuring, as we have documents in these cases that somehow make things possible and also how materialisations can hinder some of the processes of infrastructure, so existing systems create tensions and frictions. We also talked about how these materialisations become a way - to take this metaphor of the rhizome - to describe something that emerges, so the whole pro

cess becomes a little bit more visible. We talked also a lot about learning. We went back to Bateson's idea of levels of communication and learning. Star & Ruhleder (1996) uses Bateson's model. According to them, when building an infrastructure, you can encounter issues on three different levels. There is the 'practical' level which is related to things and processes, the 'context' where this practice is happening, and then you have the 'goals and values' which are behind these practices. We talked a lot about how in infrastructuring there is perhaps the need for dealing with different levels of learning but also to support learning about the existing levels. Perhaps the role of the designer and the researcher is to move among different assemblies and groups and try to make them aware of these different levels and complexity. We talked also in relation to this because it's also related to how much you work in strategic and interventionist ways. Infrastructures are emergent and we think that there is some kind of balance between emergent and established agencies. We also had seeds, as the first group does, appearing somewhere in this relation.

LAYER 3

(Re)problematizing politics, participation and infrastructuring

LAYER 3: (RE)PROBLEMATIZING POLITICS, PARTICIPATION AND INFRASTRUCTURING

Participants:
Hanne Cecilie Geirbo,
Christine Hegel, Joanna Saad
Sulonen, Laura Scheepmaker

This session started with a (re)problematization of politics and questioning its relation to the concepts used by the participants. An introduction was given by Elena Parmiggiani and Giacomo Poderi, motivated by the latter's observation that 'politics' and 'infrastructuring' were understood in different ways by different people. After their presentations, we continued with the group work. Each participant briefly but explicitly reflected on their take on politics, participation, and infrastructuring. Questions raised during the discussions, were, for example: Are politics in infrastructuring different from politics in PD? From politics of participation? How? The discussion and work with the artifact was aided by highlighting tape and a collection of printed keywords collected before-hand from the position papers and from our online discussions.

MAKING AGENDAS EXPLICIT, AND CAN THERE BE PD WITHOUT ETHICS? (Group 1)

We started the discussion generally on the politics of (PD) as related to democracy. Then we started to talk about the politics of our own involvement, which related to what we first articulated with the theme of intervention. We started to look at the power we have (as PD designers) in seeding and also in triggering things to happen. At some point we started saying that okay, usually we take it for granted that all of what we do is for good. We also somehow take for granted a certain leftist agenda of PD. Something we are not articulating really, we are not (explicitly) saying that this is what we base ourselves on. From there we started toying with the idea of far-right PD (as provocation). What if all this would be (mis-)used in other ways? At some point we questioned how does that relate to infrastructuring? We didn't really answer, other than some suggestion about politics and infrastructuring. However we did ask: Does infrastructuring add anything to the discussion of politics and design? We didn't really see how that was relevant. Nonetheless the issue of politics does add something to understanding infrastructuring.

STRUCTURE
INFRA –
UN – S

INTERVENTION

NGO

BETTER
INFRAS
FOR TH
PROCE

PLASTIC

FUNDING

TIME & MONEY

CARVE OUT
A SPACE

MAFIA

Intervention

Prototypes as ...
effective?

DATA INFRASTRUCTURE
LITERACY
... PD can ...?

translation of design
research to the
language of the teachers

Politics
of
Infrastructuring

LAURA, CHRISTINE

JOANNA

SCALE?   WHY DO
WE USE
THE TERM?

a lens?

SEEDS
-ING

SEEDING
CROSS-POLLINATING
-FYING

BRANCH
OUT

speculation

MINI-FORMAL
GUERILLA

politics   Infrastructure-ing

STRANGE
MAKING

MAKING STRANGE
MAKING FAMILIAR

exPlicit
leftist agenda

PD
without   ethics?

"Smart Things"
How can we "tangify"
concepts of Smart...

Policy / bureaucracy as
rigid ... sprawling

the local

local ... meta level (policy)
... how to bring together

building relevant ...
time & funding

PEN
PLAY

INVENT
OWN
RULES

MULTIPLICITY

Invisibility

DESIGN
METHODS
TO BE
TRANSFERRED

DESIGN
IN USE

PROTOTYPES
TESTING

SCAFFOLDING
PLAY

Technical
crafting

... to PD
Design
provider

Not out

... interpretations structured

"Adhering to the
roadmap"
creates ... road blocks

ENVIRONMENT?

Time - for infrastructing
for PD

PL

local level

LEARNING TO REVEAL AND NOT TO OBSCURE (Group 2)

Karen S. Baker, Andrea Botero, Cathrine Seidelin,
Jesper Simonsen

We had some discussions on how it is important for issues of politics, all kinds of obscure and invisible aspects. From there we went back to data. Obscuring what's happening with data or making visible what's otherwise sometimes invisible seems to be important. Trying to make it visible becomes a political issue, which is represented in some of the lines on the board. For example in Catherine's, the focal point of the work would be data and how we can make data more visible in design, because eventually it will become an important part of the digital infrastructures that we are developing and designing. For that reason she asked what are the political issues of making some data available in a design process and some not? There are some tensions there and something to consider as designers. We also had a talk - building on this idea of research agenda for PD - where we look at how do we create knowledge and get it out of the laboratory and the studio. Jesper said he is looking forward to having a keynote speech next week (at SHI 2018[6]) where his message is that participatory design has something to contribute when infrastructuring healthcare. He is showing some of the issues that occur when people implement and use infrastructure and what PD knows about it.

Jesper also said that an infrastructuring approach in PD also implies emergence and therefore not knowing. How do you explain that? So he wants the message to be "you need PD". When doing that, PD kind of should look cool, and that coolness implies we know it all. However, in reality, as PD researchers attuned to infrastructuring, we know that we don't know. Part of the thing is that you have to be open to the process because you are doing it. So, you have to have this performative aspect to our board, where this note "we do not know" can be turned (by folding it) into "we know". That is another dimension of the political work. Therefore we end up proposing the importance of learning when articulating the work of participation and politics in relationship to infrastructuring.

WHY? TAKE A STAND! (Group 3)
Mette-Agger Eriksen, Christopher Frauenberger, Amanda Geppert, Sanna Martilla, Elena Parmiggiani

We concluded with a political statement, that infrastructuring is inherently political. This led also to the why, as a core question in our collage. We discussed quite a lot about our role as researchers in these kinds of processes. What methods do we apply and how to understand what actually it is that we are doing? How it is related to our own values? Because of course there are a lot of values, underlying the choice of method or approach of engaging. Where does that come from and are you actually aware of that? If you take a stand, which we all were doing as actors in these infrastructuring processes, what was that stance based upon? In Mette's experience with engagements and in line with the examples we had; she argued that this is based upon quite a lot from the professional training someone has. The educational background. One of us gave the example of still having to go and speak to technology people who say "well, we did this system but what happens to it, what it does, it's not my responsibility". There is often a distancing of responsibility of what we put in the world. Mette reflected that in her training as an industrial designer, there were a lot of related value systems but with this idea that it's not political. That was never discussed in her education really. Being aware that you are taking a stand when you are engaging with infrastructuring seems important. We also recognized this element of activism, that we politically do things. We added a few keywords to the topics we had been formulating already, for example to the aspect of narrating. If re-narrating is a big part of what's happening in infrastructuring, other phrases of languaging and naming and rhetorics are surely an issue, and a part of what this process is about. We added also new areas, a bit about the levels needed for debating those worldviews which are underlying actions, and then this overlapping also with needing to address policy

making issues or different levels of infrastructures. Of course we had divergence, whether it is the idea of infrastructuring that is good or whether it is the idea of participation or whether it is equality or something else. Of course that is political too.

FRAMES FOR ACTION (Group 4)
Alix Gerber, Helena Karasti, Giacomo Poderi, Anna Seravalli

One of the things we talked was frames for action. In terms of funding and trust and access and status, but also finding shared agendas. The ways that we relate to a project or to the work, and how those things enable some actions and disable other actions. We talked also about participation gains and why? What people are getting for participating in this work? The politics of that is complex. How that relates to what it means when we are infrastructuring, versus working on a specific project?

Infrastructuring maybe involves more distributed agencies and more people being impacted and being able to define their own roles (in the) infrastructure over time. Whereas a defined project is kind of like, these are the people who are working together. Politics are about problematising the choices that we have, and bringing up that there are other options. That is also a scary process, therefore we talked about how we make people comfortable having those discussions. We also realised that among a lot of the different projects that we were talking about, we'd seen this tactic of using technicality and applying technical roles as a way to get out of having political discussions. (Facilitator: Can you give an example?) In the case of Alix's work with policing in Ferguson, a lot of the people who are involved in reimagining policing - the residents - are thinking about what are we supposed to do, how does policing work so that they can just apply that technical rule rather than having the political discussion of how do they want it to work. We were talking about how those things are

interwoven, the technical and the political. To minimize the post-production the blue area in the collage board condenses our main message.

LAYER 4

Uncharted territories:
some research paths

LAYER 4:
UNCHARTED TERRITORIES:
SOME RESEARCH PATHS

Participants:
Hanne Cecilie Geribo, Joanna
Saad Sulonen, Christine
Hegel, Laura Scheepmaker

For the last layer, each group maps a few research paths to pursue at the intersection of participatory design, infrastructuring and politics. To build this last layer, the groups used their previous discussion and a reference list that we collectively gathered working online before the workshop. This activity is important to help us continue understanding better the relationship between politics, participation, design, and infrastructuring. What new questions arise for our own projects, and for infrastructuring in participatory design in general after the workshop?

POLITICAL AGENDAS, REFLEXIVITY AND ETHICS
(Group 1)

In our group we were talking about this issue of the need to be **explicit about political agendas when talking about infrastructuring.** When PD emerged in Scandinavia through collaborations between researchers, designers and trade unions, increasing democracy in the workplace was the goal put upfront. One of the founders of PD, Kristen Nygaard, was also active in Norwegian politics. That political core of early PD might have driven the whole field to the left-side of the political spectrum. There have been calls for reviving PD's political agenda[7] however to our knowledge, there are no reflections on the leftist agenda of PD - it seems to not be explicitly articulated. We therefore proposed that we need to address this gap: to better articulate PD's original and existing political agenda as well as consider what it would mean if PD was used within contexts fostering other agendas (including ones at the extreme right of the political spectrum). Moreover, there is a need for more work on **reflexivity in PD** [8] with respect to our collective and also individual political agendas. That is also crucial when infrastructuring.
We also found an emerging discussion addressing the ethics of PD practice. We feel this is an interesting area for further reflection, especially in articulating ethical issues with respect to politics and infrastructuring.

[7] See for example: Beck, E. (2002) "P for Political: Participation is Not Enough," Scandinavian Journal of Information Systems: Vol. 14 : Iss. 1 , Article 1. Available at: https://aisel.aisnet.org/sjis/vol14/iss1/1
[8] See for example: Pihkala, S Karasti H (2016) Reflexive Engagement: Enacting Reflexivity in Design and for 'Participation in Plural', Proceedings of the 14th Participatory Design Conference: Full Papers - Volume 1, p. 21-30
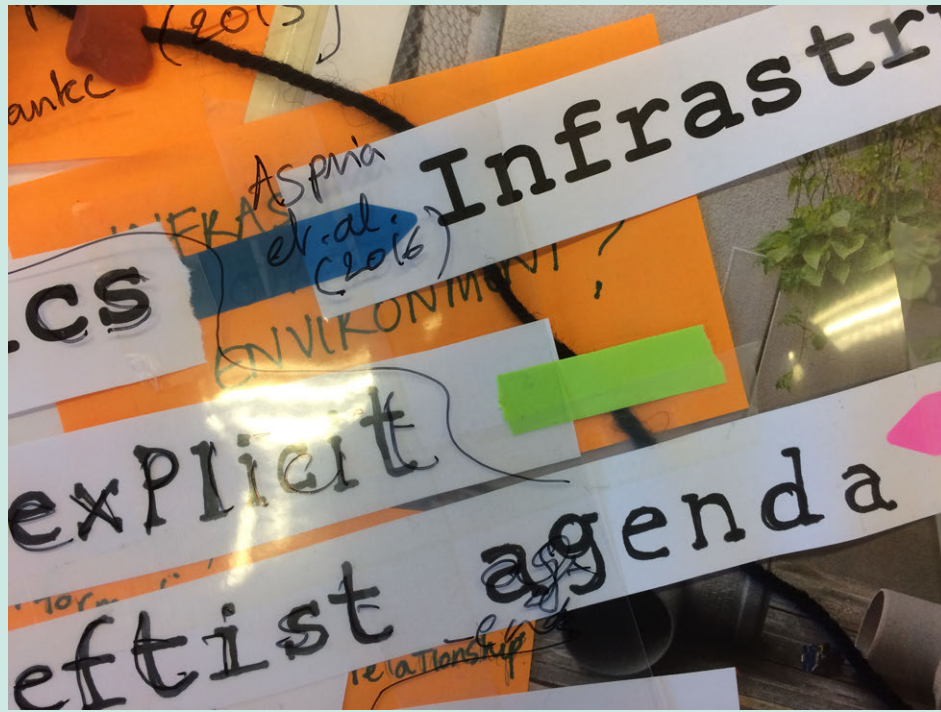
## DATA AND DESIGN, INVISIBLE WORK AND ALTERNATIVE DISSEMINATION STRATEGIES (Group 2)

Karen S. Baker, Andrea Botero, Cathrine Seidelin, Jesper Simonsen

In our group we concluded with three broad areas where research or action are needed:

First, when we talked about **data**, we labeled it as "missing territory" indicating that we need to explore aspects of the **interplay between data and design** and how that is embedded within infrastructuring processes. At the moment we do not know much about it. For example there is a good starting point in the article "Do categories have politics" by Lucy Suchman[9]. However after that not much has been produced or said.

Second, we talked about the need to continue looking at **invisible work** and to some extent **communication needs** as there is still a lot of work to do in that area to advance PD infrastructuring processes and to grapple with politics. That was evident from the kinds of work we were all presenting.

The last theme is more general: the ambition to **reach audiences in alternative ways beyond traditional publications.** We mean how we get out to a broader audience especially beyond our own communities with research knowledge? How do we convey insights we already have about PD and infrastructuring? Publications include a variety of obstacles for PD including their focus on very short-term activities. Combining publications with other types of communications would be a difficult 'turn' but could open up options. Considering that scientific publications might not always be the most efficient way to share or exchange ideas, there is a lot of work to do in reaching wider audiences.

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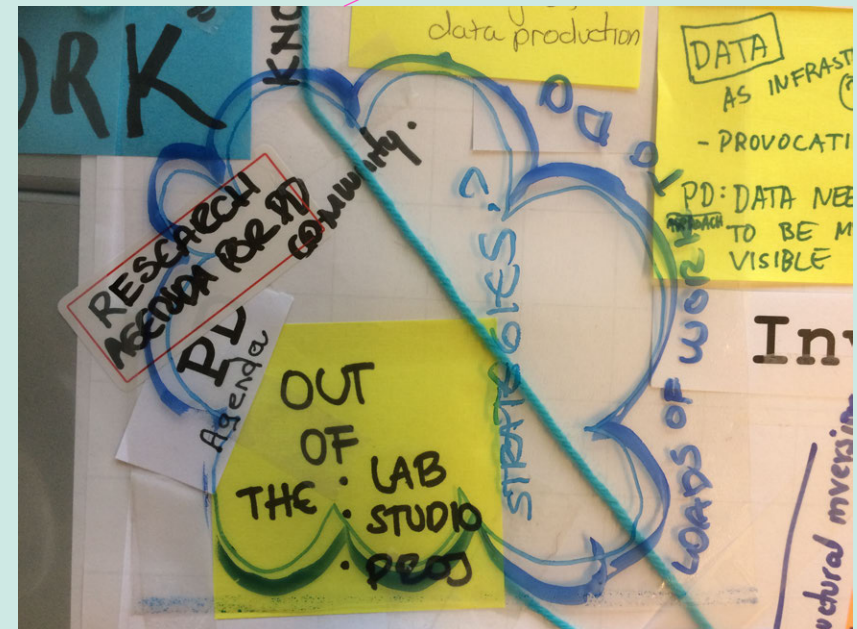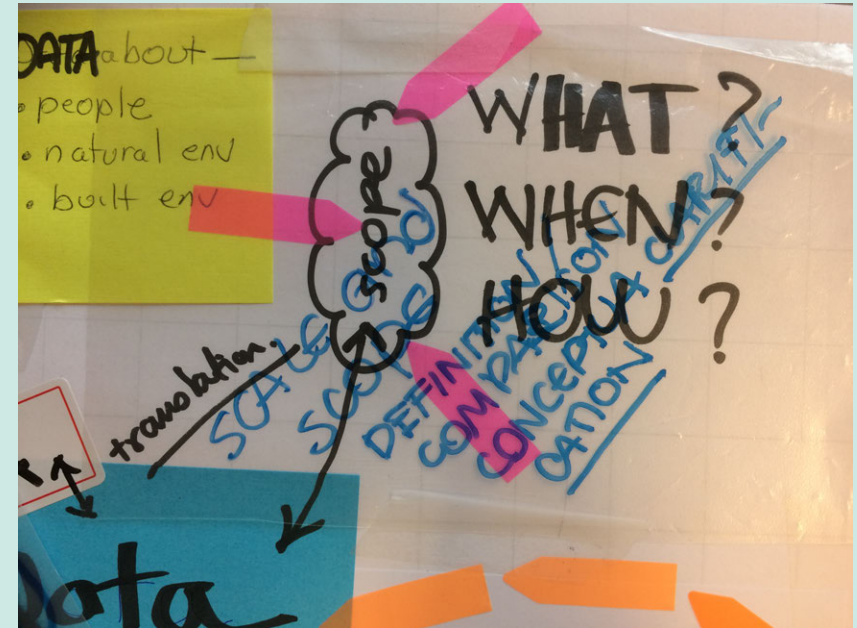
⁹ See: Suchman, L. (1993). Do categories have politics? Computer Supported Cooperative Work (CSCW), 2(3), 177–190. https://-doi.org/10.1007/BF00749015

LONG TERM STUDIES, FRAMING, ACTIVISM AND PD LOOK INTO INFRASTRUCTURING (Group 3)

Mette-Agger Eriksen, Christopher Frauenberger, Amanda Geppert, Sanna Marttila, Elena Parmiggiani

During our conversation we thought about four different aspects:

First we identified the need to have and look at more **long term cases and temporality in infrastructuring.** What does temporality in infrastructuring mean? How do we understand that? Even methodologically, what threads do you pull on to construct that field?

Secondly we talked very much about reconfiguring. We propose we need better understanding of how do we **reframe and reconfigure** engagements. What does it mean to re-reframe something? What are the implications of that? How does it change design practice? (Similar to Group 4). Framing and reframing is a lot like 'and what's the problem? And this is a core topic and an important phase in design (i.e. what is the design problem?) How does framing overlap with reconfiguring practice and infrastructring? This way we could be open to overlaps with more ideas from design practice.

The third area, in terms of opportunities and challenges, we found was the need to understand better **the role of PD practitioners as activists.** How we bring our own values and methods to this also signal infrastructuring processes. What does it mean if we are in conversation with different professions and logics, and how do we think about that?

The last one is about **revisiting the notion of infrastructuring from PD**, as opposed to thinking about it from within something like the STS tradition. There is something to revisit there because it can be an occasion for trying to give an understanding and reflect on the meaning of the terms. Sometimes we felt as if we are talking about different things.
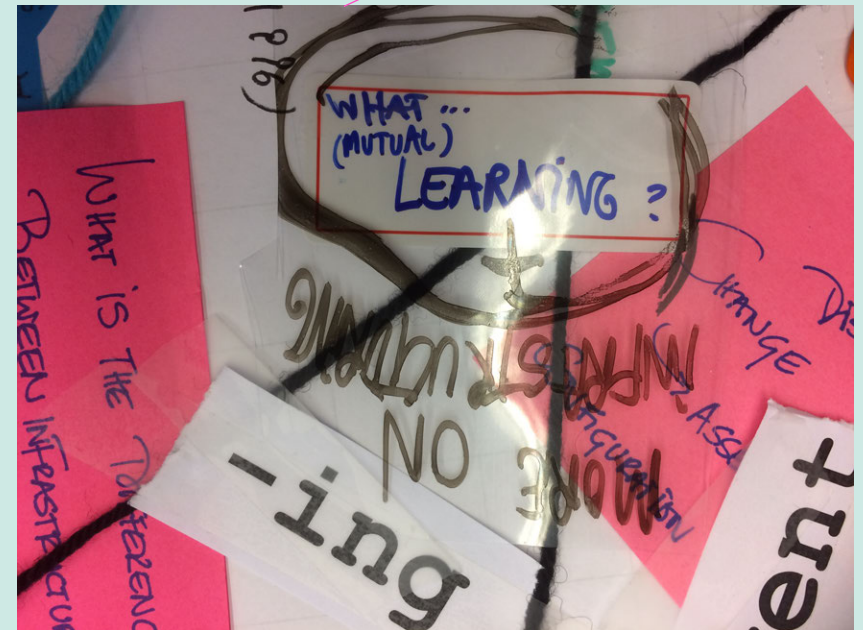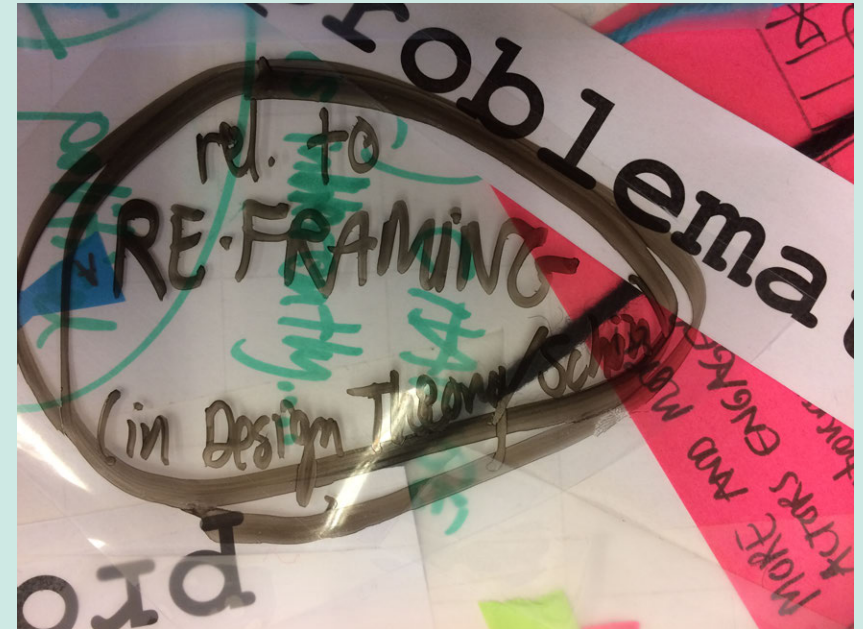
## CHANGES IN DESIGN, CREATIVE AND CRITICAL THINKING
(Group 4)
Alix Gerber, Helena Karasti, Giacomo Poderi, Anna Seravalli

In our group we discussed two important research paths for the future:

The first path is in the shape of a question: How does infrastructuring changes design and designers' practices? This question has a double edge. On one hand, it refers to an opportunity to revalue how things/concepts, such as infrastructuring, can potentially provide a different way to teach design and to practice design. It would be really valuable to have an understanding of how infrastructuring has already changed or is changing, for example, the notion and tradition of the design studio. On the other hand, it also referred to the need to continue looking at the ways PD has been appropriating (but also maybe mis-appropriating) the concept of infrastructuring. Not all of us had clarity on the paths by which infrastructuring arrived and evolved with in PD.

The second path that we think is worth exploring [6] centers on the theme of learning, to which we kept coming back to from different kinds of angles during the day. We crystallized this learning challenge with these words: creative and critical thinking as empowerment in infrastructuring.
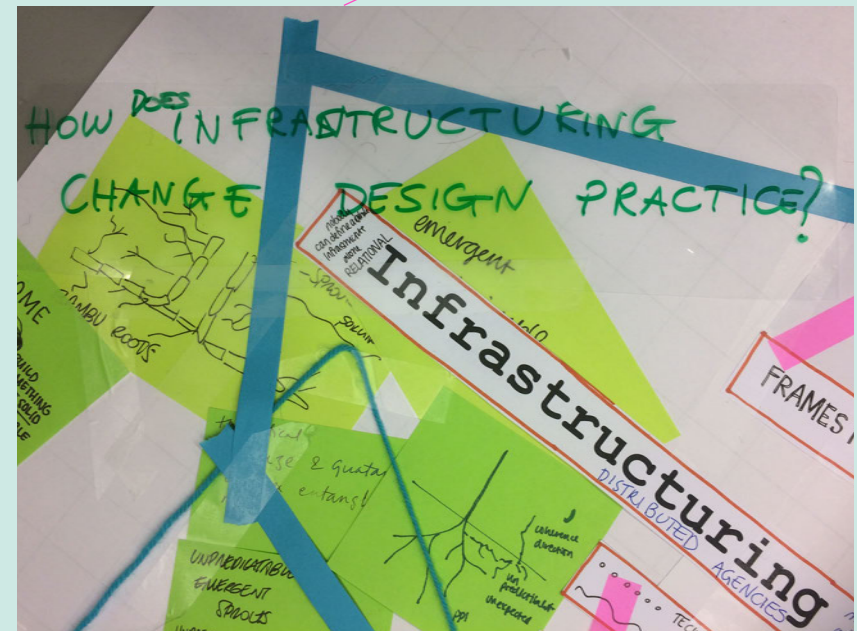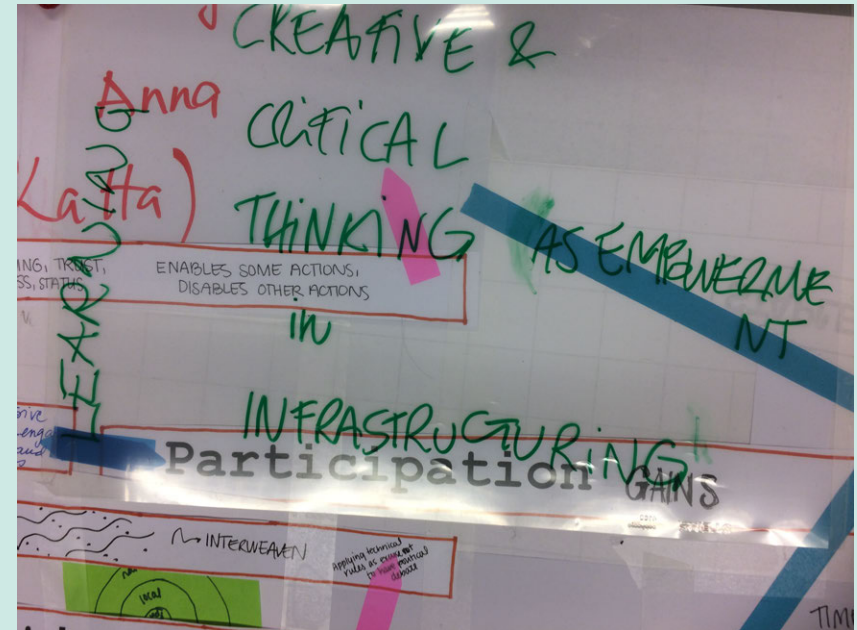
RELATED LITERATURE

The publications collected here deal with the concept of infrastructure and infrastructuring- Some directly address concerns related to participatory design, while others are framed by the traditions of Anthropology, Information Systems (IS) or the multidisciplinary fields of science and technology studies (STS) and computer supported collaborative work (CSCW). The variety of approaches and cross pollination with the literatures is an interesting phenomena in itself.

This collection has been documented collectively by participants of the workshops at PDC2018 and at a similar workshop we organized at the EASST2018 conference [10].

[10] For a reflection on the experiences of that workshop see: Baker, K S, Botero A, Geirbo HC, Karasti H, Marttila S, Parmiggiani E and Saad-Sulonen J (2018) Infrastructuring in STS: What does infrastructuring look like? When does it look like that? Workshop report. EASST Review, Vol. 37, no. 4.

1. Agid, S. (2016). "...It's Your Project, but It's Not Necessarily Your Work...": Infrastructuring, Situatedness, and Designing Relational Practice. In Proceedings of the 14th Participatory Design Conference: Full Papers - Volume 1 (pp. 81–90). New York, NY, USA: ACM. https://doi.org/10.1145/2940299.2940317

2. Agid, S. (2018). 'Dismantle, change, build': Designing abolition at the intersections of local, large-scale, and imagined infrastructures. Design Studies. https://doi.org/10.1016/j.destud.2018.05.006

3. Allhutter, D. (Forthcoming). Of "Working Ontologists" and "High-quality Human Components". The Politics of Semantic Infrastructures. In D. Ribes & J. Vertesi (Eds.), Digital STS: A Field Guide. Princeton University Press.

4. Amin, A. (2014). Lively Infrastructure. Theory, Culture & Society, 31(7–8), 137–161. https://doi.org/10.1177/0263276414548490

5. Appel, H., An, N., & Gupta, A. (2015, September 24). Introduction: The Infrastructure Toolbox. Retrieved April 24, 2018, from https://culanth.org/fieldsights/714-introduction-the-infrastructure-toolbox

6. Aspria, M., Mul, M. de, Adams, S., & Bal, R. (2016). Of Blooming Flowers and Multiple Sockets: The Role of Metaphors in the Politics of Infrastructural Work. Science & Technology Studies, 29(3), 68–87.

7. Baker, K., & Millerand, F. (2012). Infrastructuring Ecology: Challenges in Achieving Data Sharing. In J. Parker, N. Vermeulen, & B. Penders (Eds.), Collaboration in the New Life Sciences. Ashgate Publishing, Limited.

8. Baker, K. S., & Karasti, H. (2018). Data Care and Its Politics: Designing for Local Collective Data Management As a Neglected Thing. In Proceedings of the 15th Participatory Design Conference: Full Papers - Volume 1 (pp. 10:1–10:12). New York, NY, USA: ACM. https://doi.org/10.1145/3210586.3210587

9. Beck, E. (2002). P for Political: Participation is Not Enough. Scandinavian Journal of Information Systems, 14(1).

10. Berlant, L. (2016). The commons: Infrastructures for troubling times. Environment and Planning D: Society and Space, 34(3), 393–419.

11. Björgvinsson, E., Ehn, P., & Hillgren, P.-A. (2010). Participatory Design and "Democratizing Innovation." In Proceedings of the 11th Biennial Participatory Design Conference (pp. 41–50). New York, NY, USA: ACM. https://doi.org/10.1145/1900441.1900448

12. Björgvinsson, E., Ehn, P., & Hillgren, P.-A. (2012). Design Things and Design Thinking: Contemporary Participatory Design Challenges. Design Issues, 28(3), 101–116. https://-doi.org/10.1162/DESI_a_00165

13. Blok, A., Nakazura, M., & Winthereik, B. R. (2016). Infrastructuring Environments. Science as Culture, 25, 1–22. https://doi.org/10.1080/09505431.2015.1081500

14. Blomberg, J., & Karasti, H. (2012). Ethnography: positioning ethnography within participatory design. In Routledge International Handbook of Participatory Design (pp. 86–116). New York: Routledge Taylor and Francis Group.

15. Bødker, S., Dindler, C., & Iversen, O. S. (2017). Tying Knots: Participatory Infrastructuring at Work. Computer Supported Cooperative Work (CSCW), 1–29. https://doi.org/10.1007/s10606-017-9268-y

16. Bossen, C., & Markussen, R. (2010). Infrastructuring and Ordering Devices in Health Care: Medication Plans and Practices on a Hospital Ward. Computer Supported Cooperative Work (CSCW), 19(6), 615–637. https://doi.org/10.1007/s10606-010-9131-x

17. Bowker, G. C. (2000). Biodiversity Datadiversity. Social Studies of Science, 30(5), 643–683. https://doi.org/10.1177/030631200030005001

18. Bowker, G. C., Baker, K., Millerand, F., & Ribes, D. (2009). Toward Information Infrastructure Studies: Ways of Knowing in a Networked Environment. In J. Hunsinger, L. Klastrup, & M. Allen (Eds.), International Handbook of Internet Research (pp. 97–117). Springer Netherlands. https://doi.org/10.1007/978-1-4020-9789-8_5

19. Bowker, G. C., & Star, S. L. (1999). Sorting Things Out: Classification and Its Consequences. Cambridge, MA: The MIT Press.

20. Capaccioli, A., Poderi, G., Bettega, M., & D'Andrea, V. (2016). Participatory Infrastructuring of Community Energy. In Proceedings of the 14th Participatory Design Conference: Short Papers, Interactive Exhibitions, Workshops - Volume 2 (pp. 9–12). New York, NY, USA: ACM. https://doi.org/10.1145/2948076.2948089

21. Carey, M., & Pedersen, M. A. (2017). Introduction: Infrastructures of Certainty and Doubt. The Cambridge Journal of Anthropology, 35(2), 18–29. https://doi.org/10.3167/cja.2017.350203

22. Cass, N., Schwanen, T., & Shove, E. (2018). Infrastructures, intersections and societal transformations. Technological Forecasting and Social Change, 137, 160–167. https://doi.org/10.1016/j.techfore.2018.07.039

23. Clement, A., McPhail, B., Smith, K. L., & Ferenbok, J. (2012). Probing, Mocking and Prototyping: Participatory Approaches to Identity Infrastructuring. In Proceedings of the 12th Participatory Design Conference: Research Papers - Volume 1 (pp. 21–30). New York, NY, USA: ACM. https://doi.org/10.1145/2347635.2347639

24. Cohn, M. L. (2016). Convivial Decay: Entangled Lifetimes in a Geriatric Infrastructure. In Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing (pp. 1511–1523). New York, NY, USA: ACM. https://doi.org/10.1145/2818048.2820077

25. Crabu, S., & Magaudda, P. (2018). Bottom-up Infrastructures: Aligning Politics and Technology in building a Wireless Community Network. Computer Supported Cooperative Work (CSCW), 27(2), 149–176. https://doi.org/10.1007/s10606-017-9301-1

26. DiSalvo, C., Clement, A., & Pipek, V. (2012). Communities: Participatory Design for, with and by communities. In Routledge International Handbook of Participatory Design (pp. 182–209). New York.

27. Dittrich, Y., Bolmsten, J., & Eriksson, J. (2017). End User Development and Infrastructuring – Sustaining Organizational Innovation Capabilities. In F. Paternò & V. Wulf (Eds.), New Perspectives in End-User Development (pp. 165–206). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-60291-2_8

28. Dreessen, K., Huybrechts, L., Grönvall, E., & Hendriks, N. (2017). Infrastructuring Multicultural Healthcare Information Systems. In A. M. Kanstrup, A. Bygholm, P. Bertelsen, & C. Nøhr (Eds.), Participatory Design & Health Information Technology (pp. 30–44). IOS Press.

29. Edwards, P., Bowker, G., Jackson, S., & Williams, R. (2009). Introduction: An Agenda for Infrastructure Studies. Journal of the Association for Information Systems, 10(5).

30. Edwards, P. N., Jackson, S., Bowker, G., & Knobel, C. (2007). Understanding Infrastructure: Dynamics, Tensions, and Design. Ann Harbour: Deep Blue.

31. Egyedi, T., & Mehos, D. (2012). Inverse Infrastructures: Disrupting Networks from Below. Cheltenham, UK; Northhampton, MA: Edward Elgar Publishing.

32. Ehn, P. (2008). Participation in Design Things. In Proceedings of the 8th Participatory Design Confernece Experiences and Challenges (pp. 92–101). Bloomington, Indiana: CPSR/ACM.

33. Frangos, M., Garvey, T., & Knezevic, I. (2017). Infrastructuring Place. Citizen-led Placemaking and the Commons. The Design Journal, 20(sup1), S3279–S3293. https://doi.org/10.1080/14606925.2017.1352832

34. Geiger, R. S., & Ribes, D. (2010). The Work of Sustaining Order in Wikipedia: The Banning of a Vandal. In Proceedings of the 2010 ACM Conference on Computer Supported Cooperative Work (pp. 117–126). New York, NY, USA: ACM. https://doi.org/10.1145/1718918.1718941

35. Hanseth, O., Monteiro, E., & Hatling, M. (1996). Developing Information Infrastructure: The Tension Between Standardization and Flexibility. Science, Technology, & Human Values, 21(4), 407–426. https://doi.org/10.1177/016224399602100402

36. Harvey, P., Jensen, C. B., & Morita, A. (Eds.). (2016). Infrastructures and Social Complexity: A Companion (1 edition). Routledge.

37. Haskel, L., & Graham, P. (2016). Whats GNU Got to Do with It?: Participatory Design, Infrastructuring and Free/Open Source Software. In Proceedings of the 14th Participatory Design Conference: Short Papers, Interactive Exhibitions, Workshops - Volume 2 (pp. 17–20). New York, NY, USA: ACM. https://doi.org/10.1145/2948076.2948090

38. Hector, P. (2018). Making and repairing places for making and repairing. Strategic Design Research Journal, 11(2), 115-124–124. https://doi.org/10.4013/sdrj.2018.112.07

39. Hillgren, P.-A., Seravalli, A., & Emilson, A. (2011). Prototyping and Infrastructuring in Design for Social Innovation. CoDesign, International Journal of CoCreation in Design and the Arts, 7(3–4), 169–183.

40. Huybrechts, L., Dreessen, K., & Hagenaars, B. (2018). Building Capabilities Through Democratic Dialogues. Design Issues, 34(4), 80–95. https://doi.org/10.1162/desi_a_00513 ange, 137, 160–167. https://doi.org/10.1016/j.techfore.2018.07.039

41. Jackson, S. J. (2016). Speed, Time, Infrastructure: Temporalities of Breakdown, Maintenance, and Repair. In J. Wajcman & N. Dodd (Eds.), The Sociology of Speed: Digital, Organizational, and Social Temporalities. Oxford University Press.

42. Jalbert, K. (2016). Building Knowledge Infrastructures for Empowerment: A Study of Grassroots Water Monitoring Networks in the Marcellus Shale. Science & Technology Studies, 29(2), 26–43.

43. Jensen, C. B., & Morita, A. (2015). Concept note: Infrastructures as Ontological Experiments. Engaging Science, Technology and Society, 1, 81–87.

44.   Jensen, C. B., & Morita, A. (2017). Introduction: Infrastructures as Ontological Experiments. Ethnos, 82(4), 615–626. https://doi.org/10.1080/00141844.2015.1107607

45. Karasti, H. (2014). Infrastructuring in Participatory Design. In Proceedings of the 13th Participatory Design Conference: Research Papers - Volume 1 (pp. 141–150). New York, NY, USA: ACM. https://doi.org/10.1145/2661435.2661450

46. Karasti, H., & Baker, K. S. (2004). Infrastructuring for the Long-Term: Ecological Information Management. In Proceedings of the 37th Annual Hawaii International Conference on System Sciences (HICSS'04) - Track 1 - Volume 1 (p. 10020.3). Washington, DC, USA: IEEE Computer Society.

47. Karasti, H., & Blomberg, J. (2017). Studying Infrastructuring Ethnographically. Computer Supported Cooperative Work (CSCW), 1–33. https://doi.org/10.1007/s10606-017-9296-7

48. Karasti, H., Botero, A., Parmiggiani, E., Baker, K., Marttila, S., Saad-Sulonen, J., & Geirbo, H. C. (2018). Infrastructuring in PD: What Does Infrastructuring Look Like? When Does It Look Like That? In Proceedings of the 15th Participatory Design Conference: Short Papers, Situated Actions, Workshops and Tutorial - Volume 2 (pp. 45:1–45:3). New York, NY, USA: ACM. https://doi.org/10.1145/3210604.3210618

49. Karasti, H., Millerand, F., Hine, C. M., & Bowker, G. C. (2016). Knowledge infrastructures: Part I-IV. Science & Technology Studies, 29.

50. Karasti, H., Pipek, V., & Bowker, G. C. (2018). An Afterword to 'Infrastructuring and Collaborative Design.' Computer Supported Cooperative Work (CSCW), 1–23. https://doi.org/10.1007/s10606-017-9305-x

51. Karasti, H., & Syrjänen, A.-L. (2004). Artful infrastructuring in two cases of community PD. In Proceedings of the eighth conference on Participatory design: Artful integration: interweaving media, materials and practices - Volume 1 (pp. 20–30). New York, NY, USA: ACM. https://doi.org/10.1145/1011870.1011874

52. Koerten, H. (2011). Taming Technology: The Narrative Anchor Reconciling Time, Territory and Technology in Geoinformation Infrastructures. Amsterdam: IOS Press.

53. Koerten, H., & Veenswijk, M. (2011). Thinking in circles: How national geo-information infrastructures cannot escape from the temptation of technology. In Spatial Data Infrastructures in Context: North and South. CRC Press/Taylor & Francis.

54. Kohtala, C., & Bosqué, C. (2014). The Story of MIT-Fablab Norway: Community Embedding of Peer Production. Journal of Peer Production, (5).

55.   Korn, M., & Voida, A. (2015). Creating Friction: Infrastructuring Civic Engagement in Everyday Life. In Proceedings of The Fifth Decennial Aarhus Conference on Critical Alternatives (pp. 145–156). Aarhus, Denmark: Aarhus University Press. https://doi.org/10.7146/aahcc.v1i1.21198

56. Kubitschko, S. (2017). Humanitarian Media Intervention: Infrastructuring in Times of Forced Migration. Spheres, (3).

57. Langstrup, H. (2013). Chronic care infrastructures and the home. Sociology of Health & Illness, 35(7), 1008–1022. https://doi.org/10.1111/1467-9566.12013

58. Larkin, B. (2013). The Politics and Poetics of Infrastructure. Annual Review of Anthropology, 42(1), 327–343. https://doi.org/10.1146/annurev-anthro-092412-155522

59. Le Dantec, C., & DiSalvo, C. (2013). Infrastructuring and the Formation of Publics in Participatory Design. Social Studies of Science, 43(2), 241–264. https://doi.org/10.1177/0306312712471581

60. Lee, C. P., Dourish, P., & Mark, G. (2006). The Human Infrastructure of Cyberinfrastructure. In Proceedings of the 2006 20th Anniversary Conference on Computer Supported Cooperative Work (pp. 483–492). New York, NY, USA: ACM. https://doi.org/10.1145/1180875.1180950

61. Lyle, P., Sciannamblo, M., & Teli, M. (2018). Fostering Commonfare. Infrastructuring Autonomous Social Collaboration. In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (pp. 452:1–452:12). New York, NY, USA: ACM. https://doi.org/10.1145/3173574.3174026

62. Manning, E. (2007). Politics of Touch: Sense, Movement, Sovereignty (NED-New edition). University of Minnesota Press.

63. Marttila, S. (2016). From rules in use to culture in use — Commoning and infrastructuring practices in an open cultural movement. In Proceedings of DRS 2016, Design Research Society 50th Anniversary Conference (p. 454). Brighton, UK: DRS Society.

64. Marttila, S., & Botero, A. (2016). Bees, drones and other Things in public space: Strategizing in the city. Strategic Design Research Journal, 9(2), 75–88. https://doi.org/10.4013/sdrj.2016.92.03

65. Marttila, S., & Botero, A. (2017). Infrastructuring for Cultural Commons. Computer Supported Cooperative Work (CSCW), 26(1–2), 97–133. https://doi.org/10.1007/s10606-017-9273-1

66. Marttila, S., Botero, A., & Saad-Sulonen, J. (2014). Towards Commons Design in Participatory Design. In Proceedings of the 13th Participatory Design Conference: Short Papers, Industry Cases, Workshop Descriptions, Doctoral Consortium Papers, and Keynote Abstracts - Volume 2 (pp. 9–12). New York, NY, USA: ACM. https://doi.org/10.1145/2662155.2662187

67. Mattern, S. (2016). Scaffolding, Hard and Soft: Critical and Generative Structures. In J. Sayers (Ed.), The Routledge Companion to Media Studies and Digital Humanities. Routledge.

68. Merriman, P. (2016). Mobility Infrastructures: Modern Visions, Affective Environments and the Problem of Car Parking. Mobilities, 11(1), 83–98. https://doi.org/10.1080/17450101.2015.1097036

69. Mikalsen, M., Farshchian, B. A., & Dahl, Y. (2018). Infrastructuring as Ambiguous Repair: A Case Study of a Surveillance Infrastructure Project. Computer Supported Cooperative Work (CSCW), 27(2), 177–207. https://doi.org/10.1007/s10606-017-9302-0

70. Mongili, A., & Pellegrino, G. (Eds.). (2014). Information Infrastructure(s): Boundaries, Ecologies, Multiplicity (Unabridged edition edition). Newcastle upon Tyne: Cambridge Scholars Publishing.

71. Morita, A. (2016). Infrastructuring Amphibious Space: The Interplay of Aquatic and Terrestrial Infrastructures in the Chao Phraya Delta in Thailand. Science as Culture, 25(1), 117–140. https://doi.org/10.1080/09505431.2015.1081502

72. Morita, A. (2017). Multispecies Infrastructure: Infrastructural Inversion and Involutionary Entanglements in the Chao Phraya Delta, Thailand. Ethnos, 82(4), 738–757. https://doi.org/10.1080/00141844.2015.1119175

73. Mosconi, G., Korn, M., Reuter, C., Tolmie, P., Teli, M., & Pipek, V. (2017). From Facebook to the Neighbourhood: Infrastructuring of Hybrid Community Engagement. Comput. Supported Coop. Work, 26(4–6), 959–1003. https://doi.org/10.1007/s10606-017-9291-z

74. Moss, T. (2009). Intermediaries and the Governance of Sociotechnical Networks in Transition. Environment and Planning A: Economy and Space, 41(6), 1480–1495. https://doi.org/10.1068/a4116

75. Moss, T. (2016). Discarded surrogates, modified traditions, welcome complements: The chequered careers of alternative technologies in Berlin's infrastructure systems. Social Studies of Science, 46(4), 559–582. https://doi.org/10.1177/0306312716657205

76. Neumann, L. J., & Star, S. L. (1996). Making Infrastructure: The Dream of a Common Language. In Proceedings of the 4th biennial Participatory Design Conference, PDC 1996 (pp. 231–240). Cambridge, Massachusets: CPSR.

77. Nold, C. (2018). Turning controversies into Questions of Design: Prototyping Alternative Metrics for Heathrow Airport. In N. Marres, M. Guggenheim, & A. Wilkie (Eds.), Inventing the Social (pp. 94–124). Mattering Press.

78. Parks, L., & Starosielski, N. (Eds.). (2015). Signal Traffic: Critical Studies of Media Infrastructures (1st edition). Urbana: University of Illinois Press.

79. Parmiggiani, E. (2015). Integration by Infrastructuring: The Case of Subsea Environmental Monitoring in Oil and Gas Offshore Operations. NTNU.

80. Parmiggiani, E., & Karasti, H. (2018). Surfacing the Arctic: Politics of Participation in Infrastructuring. In Proceedings of the 15th Participatory Design Conference: Short Papers, Situated Actions, Workshops and Tutorial - Volume 2 (pp. 7:1–7:5). New York, NY, USA: ACM. https://doi.org/10.1145/3210604.3210625

81. Parmiggiani, E., Karasti, H., Baker, K., & Botero, A. (2018, June 13). Politics in environmental research infrastructure formation: When top-down policy-making meets bottom-up fragmentation. Retrieved September 12, 2018, from http://blog.castac.org/2018/06/research-infrastructure/

82. Parmiggiani, E., Monteiro, E., & Hepsø, V. (2015). The Digital Coral: Infrastructuring Environmental Monitoring. Computer Supported Cooperative Work (CSCW), 24(5), 423–460. https://doi.org/10.1007/s10606-015-9233-6

83. Pihkala, S., & Karasti, H. (2016). Reflexive Engagement: Enacting Reflexivity in Design and for "Participation in Plural." In Proceedings of the 14th Participatory Design Conference: Full Papers - Volume 1 (pp. 21–30). New York, NY, USA: ACM. https://doi.org/10.1145/2940299.2940302

84. Pipek, V., Karasti, H., & Bowker, G. C. (2017). A Preface to 'Infrastructuring and Collaborative Design.' Computer Supported Cooperative Work (CSCW), 26(1–2), 1–5. https://doi.org/10.1007/s10606-017-9271-3

85. Pipek, V., & Syrjänen, A.-L. (2006). Infrastructuring As Capturing In-Situ Design. In 7th Mediterranean Conference on Information Systems, (Vol. 1). Venice, Italy: Association of Information Systems.

86. Pipek, V., & Wulf, V. (2009). Infrastructuring: Towards an integral perspective on the design and use of information technology. Journal of the Association for Information Systems, 10(5), 447–473.

87. Poderi, G., Bettega, M., Capaccioli, A., & D'Andrea, V. (2018). Disentangling participation through time and interaction spaces–the case of IT design for energy demand management. CoDesign, 14(1), 45–59. https://doi.org/10.1080/15710882.2017.1416145

88. Poderi, G., Mongili, A., & Pellegrino, G. (2014). The Design Knowledge Multiple: Deconstructing Balance in an Open Source Video Game Infrastructure. In Information Infrastructure(s): Boundaries, Ecologies, Multiplicity (pp. 78–98). Cambridge Scholars Publishing.

89. Pollock, N., & Williams, R. (2010). e-Infrastructures: How Do We Know and Understand Them? Strategic Ethnography and the Biography of Artefacts. Computer Supported Cooperative Work (CSCW), 19(6), 521–556. https://doi.org/10.1007/s10606-010-9129-4

90. Portela, M., Acedo, A., & Granell-Canut, C. (2018). Looking for "in-between" Places. Media Theory, 2(1), 108–133.

91. Saad-Sulonen, J., Eriksson, E., Halskov, K., Karasti, H., & Vines, J. (n.d.). Temporal lenses in Participatory Design. CoDesign - International Journal of CoCreation in Design and the Arts, 14(1), 4–16. http://dx.doi.org/10.1080/15710882.2018.1426773.

92. Seravalli, A. (2012). Infrastructuring for Opening Production, from Participatory Design to Participatory Making? In Proceedings of the 12th Participatory Design Conference: Exploratory Papers, Workshop Descriptions, Industry Cases - Volume 2 (pp. 53–56). New York, NY, USA: ACM. https://doi.org/10.1145/2348144.2348161

93. Seravalli, A. (2018). Infrastructuring Urban Commons over Time: Learnings from Two Cases. In Proceedings of the 15th Participatory Design Conference: Full Papers - Volume 1 (pp. 4:1–4:11). New York, NY, USA: ACM. https://doi.org/10.1145/3210586.3210593

94. Seravalli, A., & Eriksen, M. A. (2017). Beyond collaborative services: Service design for sharing and collaboration as a matter of commons and infrastructuring. In D. Sangiorgi & A. Prendiville (Eds.), Designing for Service: Key Issues and New Directions. Bloomsbury.

95. Simonsen, J., & Hertzum, M. (2012). Sustained Participatory Design: Extending the Iterative Approach. Design Issues, 28(3), 10–21. https://doi.org/10.1162/DESI_a_00158

96. Simonsen, J., Hertzum, M., & Karasti, H. (2015). Supporting Clinicians in Infrastructuring. In Proceedings of the Fifth International Workshop on Infrastructures for Health care (IHC): Patient-Centred Care and Patient generated Data. Trento, Italy: University of Trento.

97. Simonsen, J., Hertzum, M., & Scheuer, J. D. (2018). Quality Development in Health Care: Participation vs. Accreditation. Nordic Journal of Working Life Studies, 8(S3). https://doi.org/10.18291/njwls.v8iS3.105276

98. Sjørslev, I. (2017). Ritual Infrastructure: Roads to Certainty in Two Brazilian Religions. The Cambridge Journal of Anthropology, 35(2), 65–78. https://doi.org/10.3167/cja.2017.350206

99. Star, S. L., & Griesemer, J. (1989). Institutional Ecology, "Translations" and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. Social Studies of Science, 19(3), 387–420.

100.   Star, S. L. (1999). The Ethnography of Infrastructure. American Behavioral Scientist, 43(3), 377–391. https://doi.org/10.1177/00027649921955326

101.   Star, S. L., & Bowker, G. (2012). How to Infrastructure. In L. A. Lievrouw & S. Livingstone (Eds.), The Handbook of New Media - Student edition (pp. 230–244). Sage Publications, Inc.

102.   Star, S. L., & Ruhleder, K. (1996). Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces. Information Systems Research, 7(1), 111–134. https://doi.org/10.1287/isre.7.1.111

103.   Stuedahl, D., Runardotter, M., & Mörtberg, C. (2016). Attachments to Participatory Digital Infrastructures in the Cultural Heritage Sector. Science & Technology Studies. Retrieved from https://sciencetechnologystudies.journal.fi/article/view/60223

104.   Vassilakopoulou, P., Grisot, M., & Aanestad, M. (2017). Friction forces and patient-centredness: Understanding how established logics endure during infrastructure transformation. Health Informatics Journal, 1460458217712053. https://doi.org/10.1177/1460458217712053

105.   Vlachokyriakos, V., Crivellaro, C., Wright, P., & Olivier, P. (2018). Infrastructuring the Solidarity Economy: Unpacking Strategies and Tactics in Designing Social Innovation. In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (pp. 481:1–481:12). New York, NY, USA: ACM. https://doi.org/10.1145/3173574.3174055

106.   Wagenknecht, S., & Korn, M. (2016). Hacking as Transgressive Infrastructuring: Mobile Phone Networks and the German Chaos Computer Club. In Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing (pp. 1104–1117). New York, NY, USA: ACM. https://doi.org/10.1145/2818048.2820027

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DRAWING TOGETHER

INFRASTRUCTURING AND POLITICS
FOR PARTICIPATORY DESIGN