DESIGNERLY ANALYSIS OF A SOCIO-PHYSICAL DESIGN ACTIVITY

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ABSTRACT
The Making Design and Analysing Interaction track at the Participatory Innovation Conference calls for submissions from ‘Makers’ who will contribute examples of participatory innovation activities documented in video and ‘Analysts’ who will analyse those examples of participatory innovation activity. The aim of this paper is to open up for a discussion within the format of the track of the roles that designers could play in analysing the participatory innovation activities of others and to provide a starting point for this discussion through a concrete example of such ‘designerly analysis’. Designerly analysis opens new analytic frames for understanding participatory innovation and contributes to our understanding of design activities.

INTRODUCTION
This paper takes as its departure point a question: what are the contributions that design can make to the analysis of participatory innovation activities?

The making design and analysing interaction track calls for two distinct kinds of submissions. On one side, designers working within processes of participatory innovation are asked to present accounts of participatory innovation activities that they have been involved in along with video recordings of these. Alongside this, interaction analysts are asked to analyse the video recordings that designers have made available. The track leaves open to individual pairs of analysts and designers what the form of their collaboration will take (e.g. whether they will present separate submissions or develop a co-authorship), but at its core is the principle of bringing together designerly and analytic perspectives on a common set of participatory innovation activities.

The structure and analytic focus of the track are highly relevant for two areas that are currently of interest for the field of design studies. Firstly, the structured sharing of video recordings is a format that is becoming increasingly popular for making empirical data about design activities available for comparative analysis (e.g. McDonnell & Lloyd 2009; Petre et al. 2010). Secondly, through its analytic focus the track aligns with a growing body of research that seeks an interaction analytic account of design activities, which addresses the need for empirical accounts of design as a situated social activity in design studies (e.g. Donovan et al. 2011; Matthews 2009; McDonnell 2009).

While we welcome these developments for the field of design studies and we see the making design and analysing interaction track as a valuable contribution to them, we also believe that it is worth reflecting on the relations the track establishes between designers and analysts and how these ‘participation frameworks’ might be differently constituted. A particular concern we have is that there may be a risk – inherent in the structure of the track – of a separation between designerly and analytic perspectives. If participatory innovation researchers are really to bring together perspectives of design and analysis, then we must find ways for designer-makers to not only be authors of first-
person accounts and subjects for the analysis of participatory innovation activities, but also to take a role in contributing to the analysis of the participatory innovation activities of others.

Analysis is itself a creative act which requires skill, judgement and qualities of care in its undertaking. Choosing an analytic frame, method and means of explanation has a large bearing on the outcome of analysis. So might design not also have a role to play?

The paper is structured as follows. In the next section, we describe our approach to designerly analysis based on the idea of re-running and critically reflecting on the design activities of other designers. We then introduce the participatory innovation case that we worked with for this paper and situate it with respect to related work from the field of field of Human-Computer Interaction (HCI). The main findings of the paper are then presented based on our re-running of several workshop activities from the case and the paper concludes with a discussion of these findings in terms of the contributions that designerly analysis can make to studies of participatory innovation activities.

A PROPOSAL FOR DESIGNERLY ANALYSIS

Our motivation for a designerly analysis approach to studying participatory innovation activities relates to long-standing calls from within the design research community for the development of research approaches based on designerly ways of knowing – complementary to scientific and humanities research traditions, which have historically had a strong influence on how design research has been done (Cross 2001; Glanville 1999). As Glanville argues, design researchers “should redress this imbalance, indicating the primacy and centrality of design both as an object of study and a means of carrying out that study” (1999, p.90).

As the basis for our approach to designerly analysis, we have taken a practice that is already widespread in the design field: namely that designers will sometimes re-run design methods originally developed by others. These re-runnings typically involve adaptations to design methods in order to fit them within the needs of a particular design context and often researchers will contribute accounts of their experiences of using a particular activity back into the research literature.

A good example of this can be seen with the uptake of the ‘cultural probes’ method in the field of HCI. Cultural Probes typically consist of a package of evocative materials, activities, and questions, designed by members of the design team as ‘probes’ of the subjective experiences of participants in a design project. Designers give probe packs to study participants for them to respond to and send back (Gaver et al. 1999). The cultural probes method has proven enormously popular in the field of HCI1 with researchers having tried out the method within many different settings and having developed numerous variations to the basic idea such as material probes, infrastructure probes, mobile probes, technology probes, urban probes and professional probes (Lucero & Mattelmäki 2007).

Some researchers have raised a critique that the ways the probes method has been taken up within HCI has diverged from the original intentions put forward by Gaver and colleagues – in many cases changing into a more targeted and outcomes-focussed method (Boehner et al. 2007). Boehner and colleagues argue that the patterns of probes adoption in HCI has been “…driven by a common desire to turn reflective, interpretive research methodologies into formal, packaged, and ideally objective methods” (2007, p.1078).

An alternative perspective is put forward by Graham and colleagues, who rather than focussing on the ways in which the probes method has diverged from the original method, instead look at the commonalities across different ways of working with probes in order to find out ‘how probes work’ (2007). As Graham and colleagues point out, “the everyday, common (if fragmentary) detail of methods being enacted in projects (through, for example, describing how probe data was interpreted) actually makes visible underlying methodological commitments” (2007, p.29).

Our call for designerly analysis is in line with this second response, which recognises that there is actually value in trying a method in a variety of ways across a variety of contexts including those for which the method may not originally have been intended, because this allows a research field to identify and discuss the characteristics of such methods. When a design method such as cultural probes is adapted and applied to a new design context, this is in a sense a design intervention, which actively uncovers new perspectives and allows for critical reflection on how the design method works. By this we not only mean reflection on the data uncovered, but rather reflection with respect to theoretical and methodological debates within the design field. This is similar to what Cross describes as “knowledge inherent in the activity of designing, gained through engaging in and reflecting on that activity” (2001, p.54). We consider this to be designerly analysis.

To guide our approach, we identify the following three criteria as minimal requirements for doing designerly analysis:

1) Designerly analysis involves (to at least some extent) engaging in design.

2) Design methods are not treated as recipes, but are adapted to the design context in which designerly analysis is done and these adaptations are recorded and reflected upon.

3) Findings are positioned with respect to relevant theoretical and methodological issues within the field and are reported back to the field.

1 At time of writing the ACM digital library records 290 citations for the original article: http://dl.acm.org/citation.cfm?id=291235
THE DESIGN WORKSHOP CASE

The design case that we have worked with for the making design and analysing interaction track is described by Kocaballi and colleagues (2012). Kocaballi and colleagues describe how they ran a design workshop with the objective of exploring possibilities for technology to mediate togetherness, within a design process intended to support relational agency and the quality of multiplicity in design (Kocaballi et al. 2012). The authors’ workshop was structured with a range of activities that allowed participants different ways of engaging in design. In total, the workshop consisted of four separate sessions interspersed with reflection and discussion and organized as follows:

- A silence session in which participants closed their eyes and concentrated on their perception of sound.
- A physical exercise session where participants worked in pairs to gain an awareness of their physical relation to one-another.
- A rich poster session involving the collaborative making of a collage on the theme of ‘togetherness’.
- A performance session in which participants performed five short activities with a variety of electronic mediating device.

The authors’ objective of supporting togetherness through technical mediation relates to an area of current interest in the field of HCI, which is the notion of designing for Embodied Interaction. This broad area of research encompasses a number of separate approaches to human-computer interaction including computer-supported cooperative work, tangible interaction, social computing and ubiquitous computing (Dourish 2001). Embodied interaction expands a traditional emphasis in the field of HCI on individual, cognitive and screen-based interactions, to consider social relations, physical space, and people’s embodied agency (Hornecker & Buur 2006; Robertson 2002). Along similar lines, the idea of adopting a ‘socio-physical’ approach emphasises the importance of engaging with physical and social aspects of situated interaction as part of the design process (Paay et al. 2009).

Beyond questions concerning the form and functioning of computer interfaces themselves, the ‘embodied turn’ in HCI has opened important questions concerning the ways that people’s embodied selves are brought into a process of design (Donovan & Brereton 2004; Buur et al. 2004; e.g. Hummels et al. 2007; Loke & Robertson 2008). Kocaballi and colleagues’ inquiry into how relational agency and multiplicity can be supported in the design process relates directly to questions surrounding bodies and agency. The authors focus in particular on the goal to find ways that “a design process might embody a relational view of agency”, an approach they dub ‘Agency Sensitive Design’ (Kocaballi et al. 2012). Within their Agency Sensitive Design framework, the authors propose six qualities as ‘conceptual lenses’ for helping designers become sensitive to issues surrounding agency (Kocaballi et al. 2011). Out of these six qualities only one, ‘multiplicity’, was taken as a focus for the workshop under consideration. The quality of multiplicity expresses the idea that design process participants should be provided with a multiplicity of means of representation and modes of thinking to support their participation, which is reflected in the range of different kinds of activities that were included in the workshop (Kocaballi et al. 2011).

It is worth noting here that the objective of exploring possibilities for technology to mediate togetherness was chosen by Kocaballi and colleagues in order to support their interest in relational agency and multiplicity in the design process. As they point out, the objective of designing for togetherness was actually chosen it provided “a suitable concept for … accommodating a relational view of agency in the design process” (Kocaballi et al. 2012). It is not unusual for a design workshop to be used to pursue aims at different levels in the way that Kocaballi and colleagues do. What is more unusual about this particular case is that the ‘second aim’ of enquiring into multiplicity in the design process was in fact the primary research aim of running the workshop.

RE-RUNNING THE WORKSHOP

In order to carry out our ‘designerly analysis’ of Kocaballi and colleagues’ workshop, we undertook to re-run selected activities from the workshop within our own research group. We based our re-running on the descriptions provided by the authors and video that they provided of the activities as well as on our own experience of having run similar design activities in the past.

We have a long-standing interest in the design of interfaces to support socio-physical interaction and in how to involve people in these processes of design, which also played an important role in how we approached our re-running of the workshop (Donovan 2011; Donovan & Brereton 2004; Loke & Robertson 2008; Vetere et al. 2006; Satchell & Graham 2010). Our current research explores how a socio-physical approach can support inter-generational interaction and healthy ageing. Within this context, the objective from the workshop of exploring how togetherness could be supported and mediated by technologies was particularly relevant.

Based on our research interests and in consultation with Kocaballi and colleagues we chose to re-run the silence session, physical exercise session and performance session activities from the workshop. Four participants (including one of the authors) from our research group participated in our re-running of the workshop. All the participants were familiar with the area of embodied and
socio-physical interaction, as well as with participatory design. We explained to the participants that our purpose of re-running the activity was to undertake a designerly analysis of it within the context of the making design and analysing interaction track (and what we meant by this). We also explained our understanding of the aims of the original workshop: namely to explore notions of ‘togetherness’; and to enquire into how ‘multiplicity’ could be supported in the design process. Overall, we tried to engage the participants in the re-running of the workshop as competent designers and co-investigators into how the design activities might ‘work’ for the design of socio-physical interaction with a view that we might adapt the workshop activities.

We held the workshop in a large shared meeting room in which we cleared a ‘performance space’ so that participants could move around freely for the workshop activities. We also set up a version of the software for the performance session provided to us by Kocaballi and colleagues on a laptop computer attached to a sound system within the space.

During the workshop, we followed the format suggested by Kocaballi and colleagues, where each activity was interspersed by a short period of reflection and discussion about the activity itself. We made audio recordings of these discussions and compiled notes of our overall impressions immediately following the workshop. We also made short video recordings of several of the physical activity sessions, so that we could re-watch these segments of the activity for further detailed analysis if necessary. The discussion that follows is based on our subsequent analysis of this material, as well as on our own experiences as participants.

THE SILENCE AND PHYSICAL EXERCISE SESSIONS
We started the activity with the ‘silence session’ followed by the ‘physical exercise session’ that Kocaballi and colleagues had used. Prior to running the workshop, we had thought of these activities as fairly typical ‘warm up sessions’ – the kind of activities that are often carried out at the start of a workshop in order to mark a transition between the outside world and the more concentrated space of the workshop. What surprised us upon running the activities however, was how effective they seemed to be in terms of bringing participants into a bodily engagement with the theme of togetherness that the workshop was designed to investigate and in fact that they lead to some of the most fruitful discussions of the workshop.

For the silence session, we asked participants to close their eyes and listen to the sounds of the space in which the workshop was being held. We asked them to direct their attention first to the sounds of their own bodies, then to the sounds of the other people and the room and finally to the sounds from beyond the room. We then asked them to stretch out their arms and try to get a sense for the space around them – still with eyes closed and again in stages: first to either side, then in front and finally above their heads. We did not keep strict time for any of these stages, instead choosing to move on to each stage when it ‘felt right’. In total, the activity took between five and ten minutes.

Next, for the physical exercise session we asked participants to group into pairs standing facing their partner. One person in each pair was asked put their hand onto the crown of the head of their partner, who stood with eyes closed. The person with closed eyes was asked to feel and respond to the movements of the hand on their head, maintaining contact between the crown of their head and their partner’s hand as their partner gently guided them. We ran the activity for several minutes – again in silence and again until it felt that we had done the activity for a sufficient length of time. Following this, each pair swapped roles, and we repeated the activity for approximately the same amount of time with roles reversed.

For the final part of the physical exercise session, we ran the activity with a variation in which both people stood with their eyes closed and their hand placed on the crown of the head of their partner. Each person was asked to gently guide the movements of their partner with their hand and simultaneously respond to the movements of their partner’s hand resting on their head, thus ‘leading’ and ‘following’ at the same time. Once again, the activity was carried out in silence and for approximately the same amount of time.

FEELING TRUST, GETTING INTO YOURSELF
A particularly effective aspect of the way that this opening set of activities seemed to operate was in terms of their *sequencing*. Participants noted that the sequence of activities seemed to lead quite naturally to a discussion of togetherness, moving as it did from the individual silence activity; to the first of the physical activity sessions in which one partner ‘lead’ and the other ‘followed’; to the final configuration where partners were both leading and following. One participant expressed this in terms of an experience of contrast between different levels and kinds of togetherness within the sequence of activities.

Participants remarked that they found the initial silence session useful for relaxing and getting prepared for the workshop, but not necessarily in terms of getting a feel for the space or listening to the space as a literal reading of a description might suggest. For the participants, it was more a case of ‘getting into yourself’ and becoming comfortable in the environment ready to start the next activity so that ‘you can follow the next activity more freely’. Another important aspect that participants identified was that the silence session allowed them to build their sense of security and trust in the group before moving into what could be an intimidating situation of allowing another person to put their hand on your head and guide your movements. As one of the participants put it: ‘you have to also trust that nothing can happen
to you, so your environment is safe and then you also have to trust with these head things it’s a lot of how much can I trust the other person… how much am I willing to let myself go, or my control go”.

IDEAS YOU CREATE WITHOUT TALKING
Participants also noted a clear difference between the version of the physical activity where one participant lead and the other followed and the final one where pairs were asked to simultaneously lead and follow. As one participant noted, though the first version does involve a kind of togetherness, “it’s more like a dependency. Like when you know that you depend on the other”. In contrast, the final version was seen as: “…more about being connected, because you get a feedback from the other person. It’s not only the following. You have to get in tune together for instance when we started dancing. Then you know you get an idea, an approach for what to do in this situation with each other. And it’s like, some ideas you create without talking about it.”

This last statement also highlights that participants talked about the way they moved together in the activity in terms of having a common understanding through the movement rather than in terms of the physical movement itself. This was reflected in descriptions of moving together as ‘having the same idea’, having a ‘dancing memory’, or as above, of ‘ideas you create without talking’.

THE PERFORMANCE SESSION
Following the physical exercise session, we moved on to the performance session. This session was carried out in two different configurations using Nintendo wiimote controllers and a custom software program provided to us by Kocaballi and colleagues. This was a reduced version of the activity that Kocaballi and colleagues ran because we did not have access to the full range of sensing technologies used in the original version. We set the software running on a laptop, which was attached to a pair of overhead speakers within the room. The software worked by creating a simple mapping between the acceleration data coming from the wiimotes and the pitch of piano notes played through the speakers. When a wiimote was held straight up in the air, the notes would be very high and when it was pointed straight down, the notes would be low.

Before starting the activity, we reiterated to the participants that another aim of the workshop as developed by Kocaballi and colleagues was to investigate whether technical devices could also play a role in supporting togetherness and that this was the main ‘point’ of this part of the workshop. We also gave a brief non-technical demonstration of how the wiimotes responded to sound (we picked one up and waved it around for the participants). We did not go into any greater detail about the functioning of the technology in order to give the participants a chance to try and ‘figure it out’ for themselves in the activity.

In order to run this part of the workshop, we again formed into pairs. Pairs took turns either interacting with each other using the wiimotes or observing the activity from the edge of the ‘performance space’. Selected portions of the performance activity were also recorded by the spectator-participants (as shown in the screenshots below).

PATTERNS OF COOPERATIVE PERFORMANCE
Perhaps the first thing to note about the activity is that something did happen, and it did seem to be a joint activity achieved by the active engagement of both participants. Importantly, this joint performance didn’t happen by itself. It required the active engagement of both participants. There were, it seemed to us noticeable patterns and strategies that people used to help them coordinate their performance. In order to document some of these, we reviewed the video recordings that had been made of the performance activity to look for regularities and patterns in the ways that people interacted with one another.

Figure 1: Mirroring the posture and movements of a partner

The first pattern we noticed was that participants would mirror the posture, gestures and whole-body movements of their partner. Though was often initiated by one of the partners, it required both partners to recognize and ‘agree to’ the mirroring in order for it to be maintained. Often, pairs would elaborate and build on the mirroring as it progressed. For example, in Figure 1, the participants had started by copying a small hand shaking gesture, and then had gradually moved their bodies and postures into alignment until they were standing in the symmetrical pose (a). Following this, they began moving in fast circles around each other, maintaining the relation between their positions within the room (b).

Figure 2: Doing the opposite to your partner

Participants would also do the opposite to their partner, avoiding being in the same pose as the other person. An example of this is shown in Figure 2, where whenever the person on the right would put his hand in the same posture as the person on the left (either up or down), she
would switch to the opposite. This lead to a game-like activity where the person on the right tried to match the posture of the person on the left, but each time he did, she would switch to a different one.

Figure 3: Repeating a partner's actions

Participants would also repeat ‘discrete’ actions of their partner without this necessarily becoming a sustained collaborative performance. For example, Figure 3 shows two participants walking in opposite directions just after the person in the white shirt had jumped (this was not caught on camera). Immediately following this, the person in the blue shirt jumps with the same gesture (a) followed again by the person in the white shirt (b), but this not carried further by the participants.

Figure 4: Getting into the same rhythm

We also noticed that participants coordinated their movements in terms of rhythm. Initially out-of-time movements would be synchronised by the participants as shown in Figure 4 where the participants were slowly swinging their arms back and forth in time as they walked around the space in a stooped posture.

Figure 5: A back and forth pantomime ‘sword fight’.

Participants also used more pantomime-like gestures, such as the ‘sword-fight’ example shown in Figure 5. Unlike the mirroring gestures, the example here worked through a back and forth between the participants with one darting forward with their hand outstretched, while the other leapt back in response – and then vice-a-versa. Our denotation of this example as a ‘sword-fight’ is somewhat tentative, because the performance evolved without explicit verbal comment, so it could equally have been ‘throw and catch’ or some other game.

INSTRUMENTS OR ACCOMPANIMENTS?

Less apparent from the video-recordings is the feeling participants got from performing with the technology, but this was a major topic of the discussion following the activity. Although the activity was largely well received by participants and they seemed to have fun performing with one-another, in the discussion it became apparent that some of the participants felt frustrated by their interactions with the technology. A salient point seemed to be whether participants were relating to the technology as an instrument to be ‘played’ or as an ‘accompaniment’ to their movements. Participants who were more focussed on their bodily movements seemed in general happier for the sounds of the technology to just follow along – to treat it as an accompaniment. This way of interacting is in line with the kinds of observations made in the previous section of the way that participants made use of and responded to posture, gaze, proximity, and gesture in coordinating their movements. Participants agreed that this seemed to be the main way that the activity ‘worked’. As one participant noted, “maybe people are used to watching each other's body movements... So rather than worry about the music, you do the body movement thing because that's what you are tuned in to.”

In contrast, those participants who wanted to create a particular kind of sound – to treat the technology as a kind of instrument – found their interactions with the technology frustrating, because it was difficult to have a deliberate control over the sound that the technology made. This was reflected in participants’ comments that the system was not sensitive enough, that it did not afford enough control over the sound that was made, and that it was “difficult to make it do something that you wanted it to do”. Although some aspects of the mapping of the sounds seemed obvious to the participants (the mapping of high/low notes to upward/downward pointing gestures), other aspects of the mapping were difficult to uncover, such as the speed at which the notes were played and the way the two wiimotes interacted. Participants suggested that the sounds should be made slower or more discrete. They perceived the sound as continuous or thought that there were multiple instruments playing simultaneously and were surprised to discover that only single piano notes were playing for each controller.

Because of these issues, the notion of togetherness also became more difficult for participants to relate to through the activity, although interesting questions around the relationship between movement and sound remained. As one noted, “I think it gets rather boring, pretty fast, this kind of thing, because you don’t get enough control to actually make the kind of sound you...”
actually want to make. So I think the interesting thing is really also not about togetherness, but I think it’s interesting in how actually music um could come from a body’s movement, that is interesting yeah, but I think this, I don’t know.”

Several of the issues identified here were also reported by Kocaballi and colleagues as being problematic for participants in their study (Kocaballi et al. 2012), so it would seem reasonable to suggest that the activity might benefit from some refinement of the functioning of the technology. However, we would also suggest that how designers respond to these ‘problems’ depends to a large extent on what kind of design designers are aiming for from the activity. In design terms the question that needs to be considered is whether the aim is to design instruments for togetherness (i.e. technologies that support the co-creation of sound) or accompaniments to togetherness (i.e. sensors that reflect collaborative movement through sound) and to frame the activity for participants accordingly.

THE CONTRIBUTION OF DESIGNERLY ANALYSIS

The aim of this paper has been to open up for a discussion within the context of the making design and analysing interaction track of the possibility of designerly analysis. We have presented one proposal for what a designerly analysis might look like based on a re-running of one of the design cases from the conference track. It is now time to reconsider the opening question of the paper in the light of our findings from this study: what are the contributions that design can make to the analysis of participatory innovation activities?

Firstly, we see that designerly analysis can contribute to understanding embodied aspects of design activity that are difficult to access through talk alone. Many of our findings concern the feelings that people had when undertaking the activities and how these related to the way the design activities worked. We noted how the warm up session seemed important to participants for relaxing and developing a sense of trust; how the sequencing of the initial activities seemed to work to lead participants into being able to experience the idea of ‘togetherness’; and how this feeling of togetherness was experienced by participants in the physical exercise session as ‘having some ideas you create without talking’.

These aspects of design activity present challenges for an interaction analytic approach. Informed as it is by an ethno-methodological approach, Interaction Analysis relies on the assumption that the accounts people give of their actions to one another are also available to the analyst. However, at least in the example of the activity where people stood with their hands on each other’s heads this is not the case. The subtle changes of pressure people feel through the contact of their partner’s hand on their head are a kind of ‘account’ – but not one that is available to third party. One must engage as a participant in the activity in order to gain access to these kinds of experiences. Of course, our approach also relies heavily on the discussion sessions with the participants about their experiences of the activities, so we are not suggesting that analysis must rely on direct experience alone. However, this discussion is still not done in the activity, which is what an interaction analytic approach would require in order to use it for an analysis of the activity, rather it takes place afterwards and is a reflection on the activity.

Secondly, designerly analysis seems well suited to opening up for discussion of how design activities could be done differently. Apart from allowing us to discuss and compare experiences with other participants about the activities, the other thing that we noticed about the discussions was that they tended to include quite a lot of talk about how the design activities could be done differently: how they could be designed differently. Examples included suggestions to try the performance session with a wall separating participants so they had to rely more on the sounds made by one-another; including more people in the activity at once to avoid a feeling that people are watching you do ‘lounge-room dancing’; and changing the speed and mapping of the notes that the system played.

Finally, we see that designerly analysis can also contribute to and be used in conjunction with more traditional kinds of analysis such as Interaction Analysis. A good example of this is the analysis of the patterns of cooperation that people engaged in during the physical performance session. It would seem highly appropriate to combine the approach we have taken with a more detailed interaction analytic approach to delve further into the detail of how participants established and maintained their cooperative performances.

In conclusion, we have demonstrated that there is a role for design in the analysis of participatory innovation activities. Designerly analysis explicitly recognises that analysis is a creative act. Analysis can take on new forms that involve improvisation, bodily engagement and socio-physical relations leading to new analytic frames. Designerly analysis draws upon embodied aspects of design activity, which are often marginalised in accounts of design and opens up discussion about how design might be done differently leading to methodological innovation.

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