The Montage Workshop – The Recreation of Realization

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This paper argues that we need to rethink our way of representing ethnographic data within user driven innovation processes (hereafter UDI process) in order to ensure that the complex life worlds of users inform the entire technical development process. To ensure this we argue that:

1) *We need to re-create the process of realization of user complexity that the anthropologist goes through in the field and engage our technical partners in this 're-creation of realization'.*

2) *To meet this challenge we have sought inspiration within filmmaking and based on the principles of filmic montage theory we have developed 'the montage workshop'.*

3) *This method challenges the way we handle and represent ethnographic data to technical partners and by doing so it also challenges the current roles of anthropologists, technical partners and users within a UDI project.*

INTRODUCTION: THE ROLE OF THE ANTHROPOLOGIST, TECHNICAL PARTNER AND USER

With this paper we wish to expand and nuance the role of the anthropologist, technical partner and user by experimenting with a new framework: 'the montage workshops'. In the montage workshop the anthropologist not only provides complex ethnographic material about the users, but also facilitates and frames a UDI process[1]. In this UDI process the workshop participants (technical partners) are given the opportunity to go through a similar kind of realization and knowledge producing process about the complex life worlds[2] of the

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[1] We define UDI as active and close involvement of users throughout all stages of product development.

[2] In our use of 'life worlds' we draw on Schutz and Luckman (1983) and understand 'life worlds' as a reality that is lived and experienced and thereby subjective. This subjectivity is constituted through embodied social interaction and is thus a result of intersubjective life (ibid:1). In this case we focus on the complexity of concerns, needs and motivations that characterize each and every user in their everyday being in the world.

users, as the anthropologist does in the field. We argue that in the montage workshops the participants experience, realize and gain ownership over the complexity that characterizes the world inhabited by the users that we seek to understand and involve in a design process.

The role of the anthropologist in the UDI process has traditionally been, and still often is, as data collector, user reporter, expert and/or mediator between users and research partners (see Hughes *et al.* 1993). The technical partners are given roles as comparatively passive receivers of the ethnographic account. This ethnographic account will be placed somewhere on a continuum from *thin* to *thick* description (Geertz 1973). Examples of this being the use of personas and other stereotyped and simplified user conceptions as ethnographic account. Or in the 'thick' end, the ethnographic monograph or the detailed and complex report, which may not be read and fully comprehended by all research partners in the industry due to time constraints, limited potentials of the textual form, etc. (for an enlightening discussion of this viewpoint see Dalsgaard 2008).

The consequence of these scenarios being that user complexity may not inform the design process as intended. As opposed to some (e.g. Cramer *et al.* 2008), we argue that the challenge we are facing as anthropologists is not a mere challenge of how to report complex results about users to technical or design partners (for more on this critique see also Halse 2008), but is rather a question of rethinking the roles of the anthropologists, technical partners and users in the UDI process.

THE MCHA PROJECT

We draw on our experience from the project Minimum Configuration Home Automation (MCHA). The project aims to develop a wireless control device for private houses which makes it possible and relevant for people to monitor and control their energy consumption and thereby minimize their consumption and maximize their comfort. The project is a co-operation between the Engineering School of Aarhus, The Alexandra Institute, Develco Products and Seluxit.

The development of this control device is based on user driven innovation and the Alexandra Institute is responsible for designing the process of user involvement in the project. For this purpose an anthropologist is occupied full time on the project. The rest of the partnership contains engineers who are responsible for the technical development of the control device and the technical partners are all newcomers in the field of user involvement and user driven innovation. The project runs over two years from 2008-2010 and the method experiment that we are referring to in this paper was carried out in the first half year of the project. We refer to the initial user involvement which had the purpose of giving the technical partners domain knowledge about the overall motivations and needs of potential future end users and at the same time providing the partners with an in-depth and shared experience of users and user lives as complex and non-reducible.

The Challenge

The methods used to gain insight into the users' life worlds are semi-structured interviews, energy tours[3] in the home, scenario-observations and cultural probes during a period of approximately three months involving 24 families. The initial interviews gave us a bearing on what might be interesting to further elaborate through observations and cultural probes. Interviews were either recorded on tape or on video, while energy tours and observations were all videotaped. The cultural probe consisted of a ground plan of the users' home, a camera and a diary. The task was to draw their movements in the house on the floor plan, take photos of what their home looks like in the morning and in the evening and also describe their activities in the diary.

The use of different methods resulted in collected data which was materialised in many shapes and forms (audio, visual, textual and material) each giving a different feel for, and various perspectives on, the complex life worlds of the participating users. We, therefore, faced the challenge of how to design a process that fully explored the potential of our various forms of data.

Another challenge posed itself in the initial stages of the project when we experienced that our various perspectives on complex life worlds of users somewhat clashed with technical partners' dominant perceptions of users as rational economic driven individuals. But how to share the bodily experience of being in the field and realizing these complexities with people who have not been there themselves and have limited time and resources?

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We set out to design a process which could meet these challenges and for this purpose we developed *the montage workshop* which is theoretically framed by montage theory within filmmaking and related to ethnographic filmmaking.

Dialectical Montage Theory

The theoretical framework for the montage workshop is based on the principles of Eisenstein's theory of dialectical montage within film making. Eisenstein saw the audience not as mere passive spectators but as co-creators and in his dialectical montage theory he worked with how the combination of juxtaposing film shots creates wholly new intellectual abstractions within the viewer's mind (Cook 1996).

The dialectical montage is created in the film editing where two juxtaposing shots are put together in a *collision* working as thesis and antithesis creating a new synthesis, a new

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[3] An 'energy tour' refers to users taking the anthropologist on a tour of their home while telling about their daily routines and energy consumption.

meaning. The theory works with the assumption that the audience does not perceive the individual shots in the montage sequentially "but rather simultaneously, as if one were continuously superimposed upon another. That is, they respond not to an incremental or additive process in which each shot is modified by the ones which precede it (ABC is not equal to A + B + C) but to a gestalt—a totality or a whole which is different from and greater than the sum of its parts (ABC = x)" (Ibid: 170). In this manner the filmic montage also highlights the constructed character of the material, which shows us that what we are seeing is not "what is" but an explicit representation of a condensed reality (Suhr 2008).

Eisenstein's montage conceived the individual shot as *attractions* and thus working with montage is also working very consciously with the individual shots as attractions that are put together in a collision to achieve a specific outcome in the viewer.

Montage theory has also been used within ethnographic films and deals with the representational challenges in the ethnographic account. Traditionally film within ethnography was seen as a means to objectively represent "what is really happening" to the viewer through long and un-interrupted shots (Suhr 2008:10). From this point of view montage was seen as polluting the material and should be avoided.

This view is challenged by the visual anthropologist Christian Suhr (2008). According to Suhr the value of montage as a combination of constructivism and realism lies within its possibilities to combine different shots from different angles, times and places and, thereby, creating visual experiences that are not possible from only the one point of view, which we as humans are limited to (Ibid:91). The montage "attacks" its subject from different angles, thus resembling the process that the anthropologist goes through in the field gaining in-depth knowledge through comparisons of what is said and done, occupying different roles and adapting different methods (interviews, participant observation, etc.). All of which provides her with a montage of many different perspectives on the object of interest.

In this way montage theory addresses our stated problem of re-creating the realization process for the partners in our project. At the same time it addresses the problem of representation which is continuously discussed within (visual) anthropology (see e.g. Marcus & Fisher 1999)—a discussion which is as relevant as ever with anthropology's presence in the field of UDI.

Montage Workshops vs. Montage Films

In developing the montage workshop we have taken the principles from dialectical film montage and translated and transformed them into a completely different form: as workshops in the UDI process. To clarify, this means that although we are talking about montage theory within films it is not the filmic material (e.g. videos of users) that is filmed and cut according to montage theory. We have taken montage a step further and created a

whole realization process based on its principle. In other words we have developed 'montage workshops' instead of montage films.

This is done because the montage workshop enables, as opposed to montage film, inclusion of all our various forms of data and, thereby, provides the participating technical partners with multi-perspectives (Marcus 1994) on more levels than just contents, seeing that the workshop is also a montage of different forms of data (video, audio, text, drawings, etc.). For this reason we work with our different forms of data as *attractions* in the same way Eisenstein conceived filmic shots. Furthermore, inspired by the potentials of the video card game (Buur & Søndergaard 2000) all of the video and audio data in the workshops have been made tangible by turning them into video and audio cards aligning them with other tangible user data such as cultural probe material and present users. The participants in the montage workshop are engaged more actively than in viewing a film—they are immersed in the material and are actively co-creating new knowledge and tangible solutions based on the fragments they feel, see and hear, and in some workshops present users also engage in the co-creation of tangible solutions such as mock-ups.

Just like the anthropologist gains insight into users' lives through actual and bodily presence in the field with the user, the montage workshop allows the technical partners to experience the users through the tactile—they are touching, listening and seeing the users and thus experiencing and realizing user motivations and needs in a different way than what is possible in a film. In this way the workshop form offers possibilities of embodiment, realization and co-creation, which we argue is the strength of the montage workshop.

The Structure of the Montage Workshop

It is particularly the assumption that juxtaposing attractions (shots) colliding in the filmic montage create wholly new intellectual abstractions within the viewer's mind that forms the basis for using the dialectical film montage as the underlying structure of the workshop. The assumption that putting juxtaposing attractions together as thesis and antithesis can create a gestalt, or a whole that is greater than the sum of its parts, led us to the theoretical starting point where we could conceive the different empirical material as such attractions and that put together they could, in fact, create a new synthesis in our technical partner's minds working as co-creators like the audience in the dialectical film montage. Our way of treating the empirical data is somewhat radical since we decompose the data into fragments and then reconstruct them arbitrarily in the montage workshop creating new complex montage users by fragments of many users assembled in the minds of the workshop participants.

The material in our montage consists of selected data from the field in different shapes and forms: video sequences from observations, audio from interviews, cultural probe

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material in the form of drawings of ground plans, photos and diaries, and last but not least, the actual presence of users in some of the workshops.[4]

In accordance with the dialectical approach to montage we have treated our empirical data as attractions, thus fragmenting all of our material into attractions which are coupled in several new constellations in the workshops. The way the empirical data attractions are treated is corresponding to the theory of every shot having a dominant tone. The specific dominant tone in each data attraction that we wanted to emphasize was especially situations, statements and visualizations that somehow described and communicated values, motivations and needs of the users. Besides the empirical data as attractions we also wanted to experiment with the actual presence of real users being 'attractions' along with the empirical data, thus making empirical data from different users meet real users in trying to create new user complexes and gestalts in the minds of the workshop participants. This is possible because our data (including present users) is converted into "attractions" that can be put together arbitrarily and end up in different montages of user life worlds and combinations of needs and motivations.

THE MONTAGE WORKSHOPS IN PRAXIS

Our method is not developed for one workshop, but as a method for, and framing of, a whole UDI process. In the following we will explicate the use of montage theory in two different workshops.

Workshop 1

In preparation for the first workshop we transferred the empirical material from the fieldwork into selected attractions with specific dominant tones. To do this we worked through the various types of empirical data that we had collected and categorized it using the analytical concepts of *tradition of knowledge* and *concerns* comprising values, motivations and needs (Barth 1993). In this categorization patterns evolved around different, and often conflicting, themes such as "Time", "Comfort", "Community", "Presumed Knowledge", "Environmental Awareness" and "Convenience".

These patterns constitute the dominant tones in the empirical data attractions that we developed from the fieldwork. Thus we created a collection of 'attractions' that would form the basis of the montage workshop. The body of attractions consisted of: 1) various video- and audio clips that were represented as video and audio cards (Buur & Søndergaard 2000). Each video card referred to a video sequence of approx. 10 minutes of scenario-observations such as "in the kitchen", "laundry", etc. Each audio card referred to an audio clip from the

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[4] More on the selection of data later.

interviews and in both cards users described their values, motivations and needs. 2) Cultural probe packages in the form of drawings of ground plans, photos and diaries.
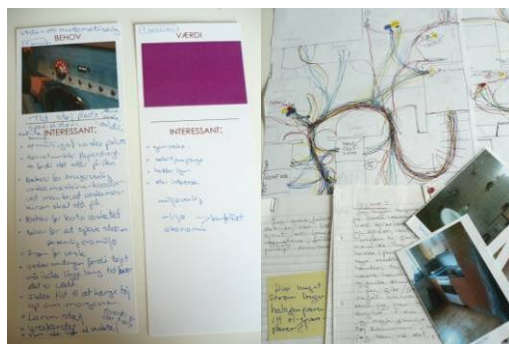

FIGURE 1 Attractions in workshop 1: Video card, audio card and cultural probe material (ground plan, photos and diary)

In the actual workshop we split the partnership into 4 groups of approx. 4 and each group had to pick a video card, an audio card and a cultural probe package. The contents of the cards and cultural probe originates from different users which means that a group might pick a video card showing a family with children making dinner, while the audio card contains statements from a retired couple and the cultural probe features a student and her two room flat. Even though the data is presented in a very fragmented form and with contradictory contents, the different forms of the data (visual, audio and material) makes it easier for the group to couple the fragments in a montage with a somewhat coherent narrative because you only see one family, hear another and experience a third.

The following task for the group was to look/listen through and analyse the material for values, motivations and needs in the broadest sense. They were then to discuss their understanding of the empirical 'attractions' and try to form a coherent narrative of the new 'montage' user.
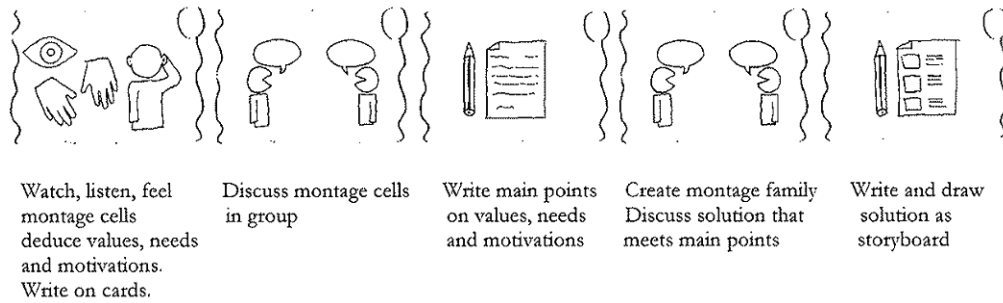
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Watch, listen, feel
montage cells
deduce values, needs
and motivations.
Write on cards.

Discuss montage cells
in group

Write main points
on values, needs
and motivations

Create montage family
Discuss solution that
meets main points

Write and draw
solution as
storyboard

FIGURE 2 Attractions are coupled together through workshop sequences in the first workshop.

At the end of the workshop each group presents their solution:

> Well, we have picked out the video as our point of departure [attraction A]. It regarded doing laundry and the lady experienced a big need for doing big batches of laundry at a time and she didn't quite know how her machine should be set so she just set it as she always did. She actually found it really annoying to do laundry [...] Furthermore she was very aware of the environment. She knew exactly what kind of detergent she was using, it was environmentally labelled and it wasn't nice to get perfume on the children's skin. So we chose to deal with this aspect of making the laundry process more efficient. We also had another interview [attraction B] in which economy was important so there was a conflict between money and environment. So we would like to make it fun and interesting to do laundry and make it easy in daily life because we also have the time aspect [...]

The group suggests making a washing machine that visualizes what kind of energy it uses and:

> [...] how much energy, CO_2 and money they have saved because the other story [attraction B] goes that the man in the house has bought a indoor climate system which is now stuck in the basement because it costs 25 thousand kr. to have it mounted so he hadn't done it even though he really wanted to because he couldn't afford it. But in this way he can save up money for that. We also had ground plan [attraction C] of a flat in which there is hardly no room for this washing machine and where to dry clothes? So we placed the machine in the bathroom and made an integrated drying cabinet in the wardrobe.

W1 – Experiences - As can be seen in the above, it didn't prove hard for the partners to couple the different forms of material and they succeeded in creating a montage narrative

comprised of the three different types of attractions (video, audio card and cultural probe) which contained different needs and values such as economic awareness vs. environmental awareness. The groups overcame the challenge of including oppositional values, needs and motivations by creating a 'montage family' in which different members of the family represented different values, needs and motivations. In this way it became clear for all that one value or motivation shouldn't dominate the generated solution and thereby the first step in de-constructing the 'rational economic user' was taken. In the solution the rational economic motivation was part in line with motivations such as "fun", "time pressure", "environmental awareness", etc.

Even though the different data-forms made it easier to couple fragments into a montage with a more or less coherent narrative, the different data-forms also turned out to be quite controlling of the solution generating process. The video material ended up being weighed higher than the other data-forms and several solutions first answered to the demands in the video and afterwards to the audio and probe material. The reason for this might be that the video-material was the longest (10 min) while the audio-material varied from 1-5 min, which meant that the video material provided the groups with the most information to relate to. The video material also provided the groups with both visual and audio in its form which probably made a better lasting impression on them. At the same time our experience was that if the audio-material and cultural probe material was more contextualized it would enter into the user narrative with as much weight as the video material. The main challenge here is to provide enough context to the presented data to create a resonance between participants and presented user material, but on the other hand not to present three full fledged users which cannot be rearranged and recreated into one montage user or montage family with many different needs and motivations.

Workshop 2

In the second workshop we wanted to take a step further and try experimenting with actual users as attractions. This workshop was a mock-up workshop and both technical partners and three users participated. Its purpose was to create mock-ups of the control system which afterwards would be tried out in the homes of other users.

The workshop comprised of three rounds: 1) storytelling 2) creation of future scenarios 3) mock-up creation. After each round the users rotated and in each round the technical partners had to deduce motivations and needs from the (new) user and work them into the task of the specific round. The most thorough user input is provided in the first round of storytelling, in which the user tells about their life based on 4 photographs which they had brought with them. In the second and third round the new users provide the group with inputs on their specific values and motivations combined with their experiences from their lives.

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FIGURE 3 Users as attractions rotate between the three technical partner groups thus the groups are involved with all three users.

Thus we tried to create new 'montage users' as in workshop 1, only this time by letting the actual users circulate as attractions between the groups during the workshop, while each group continually worked on one montage family narrative.

One of the findings in the initial user involvement was that users were very much motivated by "fun", "competition" and "community" and spurred on by Karin, a present user in the mock-up workshop [attraction A], one of the groups came up with an idea for a system which facilitated a comparison and visualization of different users' energy consumption. But even though Karin felt that this feature would be a great motivation for her, in the next round of the workshop another present user Karl [attraction B] put his foot down in regards to this and in the end the group came up with a montage solution which could include both Karin and Karl's somewhat conflicting needs and motivations. The groups thus presented their montage solution in the following:

> If we start with this more community minded thing: Here we have a collection of mailboxes in the communal staircase of an apartment complex. It has all the names of the inhabitants and a single display which pops up the minute you open your mailbox with a visualization of your energy consumption which is rated against your neighbours. […] The target is of course that you continuously benchmark yourself [your energy consumption] in relation to the others in comparable housing. Then there were some issues which Karl made us very aware of. Originally we wanted it [a screen with info on energy consumption] to be flickering on all of the mailboxes all the time [a scenario which would motivate Karin] but then Karl said: 'There is no way people will accept that!' And I agree on that somehow. First of all it has to be voluntary if you want to see that pop-up screen. And it has to be anonymous. You shouldn't be able to see which of the neighbours are consuming. On the contrary it doesn't need to be voluntary to have your data collected in the local community because that would be alright.

W2 – Experiences – As we see in the above the technical partners are again challenged in their perception of users and "forced" to create solutions that meet the various and conflicting needs and motivations of the different users that take part in the workshop as attractions. This means that the present users are coupled with all of the other users present and this new coupling of sometimes opposing fragments opens room for reflection in both user, technical partner and anthropologist.

The partners seek the coherent narrative and are challenged in trying to combine opposing needs in the mock-ups. It seems that it is more challenging to create a working montage of users that are present. Following user-rotations the partners feel inhibited because they are now dealing with a new user, which they feel cannot provide them with answers on some of their concrete questions to the preferences and needs of the earlier user. On the other hand they find it very interesting to meet different users and not only being limited to one. The participants wanted one user to be the dominant and the other users to be inspirators. This resulted in the result of the workshop being a 'montage mock-up' that met different user needs, which had been the intended purpose, instead of a montage family which was the intended result of workshop 1.

NEW ROLES – NEW INSIGHTS?

The montage workshops offer new roles for both anthropologists, technical partners and users. The anthropologist has gone from mere data collector and user reporter to facilitator and designer of a process which supports a realization process that share trades with the realization process the anthropologist goes through in the field. This role as facilitator as opposed to "user reporter" should not conceal the power that lies in framing the user insights which the technical partners construct in the montage workshop: It is the anthropologist who has generated the data in the first place and also pre-analyzed and selected out the attractions to be used in the workshop. This preparatory process most certainly sets the scene and frames the knowledge creation process but one may argue that the anthropological outset with its eye for praxis and complexity is needed to provide the technical partners with alternative views and can have a *verfremdung*-effect (Dalsgaard 2008) which challenges what is normally taken for granted about users in a field such as the technical one. At the same time the anthropological constructed "truth" about users as complex is challenged by the technicians, and in general the montage workshop can be seen as a lens which gives new access to the data from new angles and thereby provides the anthropologist with new insights on both users and technical partners.

Technical partners are performing the active role of knowledge creators instead of knowledge receivers. This knowledge creation is part of the realization process in which the users are constructed as complex and nuanced. The active participation of technical partners in co-analysis of material is not new (see e.g. Halse 2008), but the montage method takes a step further than "just" engaging the partners in co-analysis; in the montage workshop the

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partners are engaged in a realization process based on montage theory which frames the whole initial user involvement process.

The users are drawn into the project as attractions instead of fully explicated human beings. This fragmentation is somewhat of a paradox: we consciously fragment the users into simple attractions because we want to design a process which brings out the complexity of the ethnographic material in a comprehendible and irreversible manner, seeing that it is the partners themselves who are interpreting data and creating a montage and thereby constructing the users as complex. As considered above we argue that this is actually achievable when representing ethnographic data in montage workshops.

At the same time the fragmentation of users poses an ethical question in relation to how we treat and represent ethnographic informants and data. The usual critiques that have been levelled against radical constructivist cinema (see e.g. Suhr 2008) may also be levelled against our data treatment and representation in the montage workshop method which could be said to dissolve the individual to the benefit of the whole and reduce to exemplars of particular practices, values, motivations or needs so that we never really get to know the users as whole persons. However these critiques are more appropriate levelled against the montage cinema than against our workshops: Our reason for representing our data in the form of a workshop and not a film, was partly because this form could contain many different types of data; amongst others the cultural probes material that had a more intimate and "feely" character which provided the needs and values with a "flesh and blood" context and in the second workshop users were actually present. This ensured that the partners were reminded that they were developing a system for real human beings and not just social types or artificially constructed exemplars of values and needs. In this way we do actually get to know the users as human beings who are so much more than just motivations, needs and values—a narrow view of humans which would result in the opposite of our intentions of facilitating a construction of users as complex, whole human beings.

Another big difference between montage workshops and montage films is that we cannot, in the same way, control the coupling of fragments in the montage workshop because the groups arbitrarily choose the user inputs (video, audio cards and cultural probes) in the first workshop. In the mock-up workshop the interaction between users and technical partners is framed and controlled by the specific task that they must go through, but whatever else goes on between user and technical partners is not controlled. This means that the created montages are arbitrary which fully supports the principle of montage theory but at the same time the degree of conflict and variations within the montages is varying which means that some partners may not in the same degree be challenged in their preconceptions of the users.

Yet a thing to consider is that the partners are only exposed to a limited part of the ethnographic data in the workshop. We have tried to overcome this problem by summing up all of the results from the workshops and coupling them with points from the

anthropological analysis which may not have been obvious in the montage workshops. When these documents are read by people who have been engaged in the realization process, the "thin description" of user needs and motivations is given much depth because the readers is drawing on embodied experience from the montage workshops.

The above circumstances make it obvious that the montage workshop is not a stand-alone method in a UDI process. Successful in providing the technical partners with a realization of users as complex, the method is useful and, we would argue, necessary in the initial stages of a project in which technical partners (especially if new to user involvement) creates their initial knowledge of the life worlds of the users. The montage workshops hereafter provide the technical partners with a shared embodied realization of the users which they can draw on and relate to through the remaining project period. At the same time or later on in the UDI process it makes sense to engage supplementing methods of representing the users, such as textual elaborated user portraits which at this point will be more accessible for the technical partners who have gone through the realization process in the montage workshop. These supplements can ensure the more broad and elaborated user contexts which are intentionally not part of the montage workshops because we choose to unfold many different user needs and motivations instead of focusing on few elaborated users, which has the risk of categorizing users into somewhat one-sided stereotypes such as 'the environmentalist', or 'the economically aware' and so on.

More generally we see the montage workshop as a way to further democratise the UDI process and that has two related implications: first of all, more "power" is given to the technical partners because they are engaged in the creation of knowledge and as a result of this the technical partners are left with tools to keep working with the users even when the anthropologist is not there to facilitate the process. This means that the method is somewhat scalable and the theoretical montage framework can be used in other contexts and scales by anthropologists or the technical partners themselves.

CONCLUSION

In this paper we have argued that in order to make sure that user complexity is fully realized and "owned" by technical partners and further implemented in the technical development process we need to design a realization process for these partners that shares traits with the realization process that the anthropologist goes through in the field.

We show that this realization process is achievable if we design a process based on the principles of montage theory within filmmaking and refit these theoretical principles to a workshop form which is able to contain and fully utilize the many types and forms of data, each giving new perspectives and insights on user life worlds. The workshop is able to engage the technical partners (and users) actively in co-creation of knowledge and solutions. In this process we challenge the roles of anthropologist, technical partners and users. Especially the role played by the user and our way of representing the user as attractions is

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new to anthropology and the field of user involvement. With this method of representation we have taken the representation debate within anthropology (see e.g. Marcus & Fisher 1999) seriously and we believe that the montage workshops are relevant and useful alternatives to time demanding thick descriptions like written user reports or thin descriptions such as stereotyped personas.

What is obvious however is that the montage workshop is *not* new in utilizing co-analysis, co-creation of knowledge and mock-up workshops as such. The montage workshop method is a method to frame the use of these kinds of workshops and conceptualize the social processes that constitute every UDI process. Our expectation is that the montage workshop will inspire and provide new perspectives on how to frame a UDI process based on the useful principles from montage theory and hereby exploit the full potentials of user representations if we challenge the roles played by anthropologists, technical partners and users in these representations.

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