NordDesign 2018
August 14 – 17, 2018
Linköping, Sweden

The User Repertory Grid Technique to Crowdsourced User Research Analysis: A Mixed-Methods Approach to Creating Personas

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Abstract

There are many different methods for analysing user research data in user-centred design. One method is to create personas. Personas are fictive characters with a name and a face. They are based on data about the users, and designers and other stakeholders can engage in them and empathize with them as a proxy for the actual users. Personas are communication tools that make it easier for a large group of developers and designers to focus on a shared view of whom the design is for. There are different ways of creating personas, including analysis of behavioural variables and goals, thematic analysis, and mixing qualitative and quantitative methods. Creating personas relies heavily on the expertise of the user researcher and others in the design team. The creation of personas could potentially benefit from crowdsourcing the analysis of user data and hence counteract the subjectivity inherent in persona creation. The aim of this case study is to tentatively explore the possibilities and difficulties of crowdsourcing persona creation facilitated by the repertory grid technique (RGT). RGT is a mixed-methods approach that combines qualitative and quantitative data and we used it to investigate individual participants' view on the summaries and the views of the pool of participants. It is a method derived from personal construct theory (PCP), in which an individual is posed to have personal theories and expectations that direct how he or she views things (in this case a number of interview summaries). In the context of user research, we call the method User Repertory Grids. We had 28 participants in our crowdsourced analysis of five summarized user interviews. The participants' personal constructs of the summarized interviews were elicited. We then visualized the results in Bertin plots and biplots, and we calculated the importance and dominance of the constructs. We conclude that User Repertory Grids has potential to complement other methods in user modelling, but it is, in the end, no escape from subjectivity. Using this method, the subjectivity of experts is transferred to a subjectivity of the crowd.

Keywords: User-centred design, personas, repertory grid technique, user experience, user research methods

1 Introduction

In user-centered design, there are different methods for analyzing user research data. One method is to create personas, i.e. fictional characters representing groups of users that share characteristics, behaviors and motivations. Personas are common in user-centered design practice, but the method is sometimes applied without thorough grounding in data. Furthermore, the creation of personas is an effort of a few experts, which can be a threat to both validity and utility (Blomquist & Arvola, 2002). However, digitalization offers new possibilities for creating personas by crowdsourcing.

Personas are hypothetical archetypes with goals and needs that are given the form of a living character with a face and a name to facilitate empathy, communication, and storytelling (Cooper, 1999; Pruitt & Adlin, 2006; Miaskiewicz & Kozar, 2017). They are fictional creations based on patterns in data from user research, representing a set of users that share characteristics and goals and Goodwin (2011) provides the following nine step process for creating them:

1. Divide interviews by role, if appropriate
2. Identify behavioral and demographic variables
3. Map interviewees to variables
4. Identify patterns
5. Define goals
6. Clarify distinctions and add detail
7. Fill in other persona types as needed
8. Group and prioritize user personas
9. Develop the narrative and other communication

Personas are widely used in user-centered design practice, but the method has also been criticized for a lack of grounding in data (McGinn & Kotamrajo, 2008). Personas though, are supposed to be discovered in the field, and not created in a lab (Cooper, 2018). Furthermore, the creation of personas is often the task of a few user researchers or designers, which means that the analysis step also can also be criticized for being too subjective and impossible to verify (Chang, Lim, & Stolterman, 2008; Chapman & Milham, 2006).

Digitalization offers possibilities to use crowdsourcing in user modelling and creation of personas. To crowdsource means to openly outsource a task to an online community from which participants perform the task, often for a reward (Whitla, 2009). Crowdsourcing has been tested in usability studies, where benefits in cost and time were highlighted (Liu, Bias, Lease, & Kuipers, 2012). Some work in the analysis of user research can possibly also be crowdsourced. Digital tools can potentially be used to engage a crowd of people that can bring their distributed cognitive effort to analyze user data and hence counteract the subjectivity inherent in persona creation.

The aim of this case study is therefore to tentatively explore the possibilities and difficulties of crowdsourcing persona creation. Our approach, called *User Repertory Grids*, builds on a method called the repertory grid technique (RGT).

2 User Repertory Grids

The second, third, and fourth step of Goodwin's (*ibid.*) process are: (a) Identifying behavioural and demographic variables; (b) mapping interviewees to variables; and (c) identifying patterns. This is where RGT comes in. It offers a mixed-methods approach that uses a combination of qualitative and quantitative data to investigate both one participant's view and the views of the pool of participants. It is a method derived from personal construct theory.

According to this theory developed by Kelly (1955), different people have different construction systems for how they view things. Each individual has personal theories about the world, and the individual acts according to them, tests them, and over time modifies his view of the world based on them. For his convenience of anticipating events, the individual evolves a construction system dictated by an ordinal relationship between the constructs. The construction system is comprised of a finite number of dichotomous constructs that juxtapose two things with each other. For example, in a user study two constructs for how we perceive an interviewee could be Novice—Expert and Insecure—Determined. RGT is a procedure for the elicitation of such constructs (Fransella, 2003). The result of the RGT is a repertory grid where the rows are a person's constructs and the columns are the elements being rated. For instance, the constructs about users (e.g. Novice—Expert, Insecure—Determined) goes into the rows and interviewed users go into the columns.

In our RGT-based approach, a User Repertory Grid is elicited by presenting a triad of users and asking recruited participants to name an attribute that two of the users share but the third one does not. The next step is to ask the crowd member to rate each of the users on the bipolar construct. The construct is often a five-point scale. The process is repeated for a series of triads, and the ratings of each construct created are applied to all users investigated. When the repertory grids of the participants have been collected, the OpenRepGrid package for R ("OpenRepGrid Docu," n.d.) is used to analyze the grids to find correlations and association within the grids and cluster the constructs created. The dominance and importance of the constructs are also analyzed separately. Dominance is the relative elicitation percentage, and importance is the order of each construct's elicitation (Tomico, Karapanos, Levy, Mizutani, & Yamanaka, 2009). These analyses serve then as a basis for persona creation.

There are also other uses of RGT in user research. For example, Gouskos, Normark and Lundgren (2014) used RGT in combination with future workshops in an effort to investigate the different dimensions of a driver's needs. Fällman and Waterworth (2010) used RGT as a mean for measuring the user experience of different mobile devices. Tomico et al. (2009) used RGT to study cultural differences between designers' views on a set of pens.

3 Case Study

In our case study, semi-structured interviews were made with five users. The interviews were conducted with five persons that had recently migrated to Sweden and were done for a project involving the Swedish migration agency and a design agency. More details on the project can be found in a previous publication (Linder & Arvola, 2017).

3.1 Materials

The interviews were summarized into five vignettes or portraits. Their purpose was to illuminate the different personalities and situations of each interview, and thus inspire the survey participants into eliciting personal constructs about the users. The vignettes had a first-person narrative as described by Ely, Anzul, Friedman, Garner and Steinmetz (1991). Each vignette mentioned when the person described migrated to Sweden, their previous occupation, how moving to a new country had affected them, how they described themselves, how not working had affected them, and an additional quote taken from each interview which aimed to illuminate the tone of each person. Below in italics is the vignette for the user Baddi:

It has been two years now since I moved to Sweden and I see now that it will take much longer than what I had previously thought to build a life here. After having studied economics, I thought it would be easy, but I see now that I might have to take jobs such as a cleaner or a dishwasher first. I mean, I can accept doing these jobs, but it feels difficult to do them when I have an education in economics…

I am a realist though and understand that I have to take things one step at a time, I have worked with house painting and home renovations before, so I can definitely do other jobs in the beginning. I just hope that I can later work in construction and open my own company.

Right now, when there is no fulltime job on the horizon, a job that contributes to the economy in a way and does it steadily if you want to plan for a family or something, then you have in a way an income. If it was so that there was a chance that you can learn the language while working, then I would choose that in the beginning, but from the way life looks like right now, studies plus an extra job that prioritises language and contributes with economy at the same time which continuously can evolve the language it is the optimum.

3.2 Data Gathering

The analysis of the five vignettes was then crowdsourced with 28 participants (M_{AGE} = 30.6) using an online survey. The analysis elicited each participant's personal constructs of the five interviewed users. Of those twenty-eight participants, fourteen were male and fourteen were female. Two participants were omitted from the analysis due to submitting incomplete forms. From the remaining twenty-sex participants, six had completed a high school degree, three had completed a professional degree, eleven had a bachelor's degree, and six had a master's degree.

The survey presented the vignettes in combinations of three and asked them to find an attribute that two of the persons described in the vignettes had in common which the third one did not. The instructions were phrased as follows:

While contrasting Cemal, Baddi, and Abba, which attribute do you think two of the persons have in common which the third one doesn't share? When you have found an attribute write it down. After you have written it down, write down what you think the exact opposite of this attribute is.

Afterwards, participants were asked to name the opposite of the attribute they named, and the rate each of the users described in the vignettes on the resulting bipolar scale from 1 to 7. This was done for all the possible combinations of three vignettes from a pool of five vignettes, resulting to each participant creating 10 constructs, 260 in total.

3.3 Data Analysis

The results are presented in the form of a clustered re-ordered Bertin plot with dendrograms and a biplot, along with scores of importance (the order of a construct's elicitation), and dominance (the elicitation percentage of a construct). Only the first round of constructs, that is the first triad from all participants, was used for the Bertin plot and the biplot. The reason was that the full data set of 260 constructs was too large for the OpenRepGrid package. This resulted in 26 constructs. Doublets were conjoined, and their ratings averaged, which gave 19 constructs. All 260 constructs were however included in the computation of importance and dominance.

The Bertin plot (figure 1) has the ability to make information from small and medium sample sizes understandable while at the same time serves as a preliminary visualization before any analysis takes place on the data (de Falguerolles, Friedrich, & Sawitzki, 1996). The elements (shown at the top) represent the users described in the vignettes, while the constructs shown in the rows of the plot. Inside the boxes of the plot are the ratings imposed by the participants. The lighter colored squares denote lower ratings, which means that they are closer to the left side of the bipolar construct, while the darker colored squares show higher ratings, and are closer to the right side of the bipolar construct. The constructs have been rearranged based on a cluster analysis, in which the Euclidian distance (i.e. the squared distance between two sets of vectors) and similarity are used to uncover associations between the data. A Ward's minimum variance method (Ward, 1963) was employed as a mean to reveal the relations in the data. The hierarchical structure of the rated user vignettes and constructs become apparent in the dendrograms (tree structures) on the right showing the Euclidian distance between the constructs, and on the bottom of the plot where the Euclidian distance of the user vignettes can be seen.

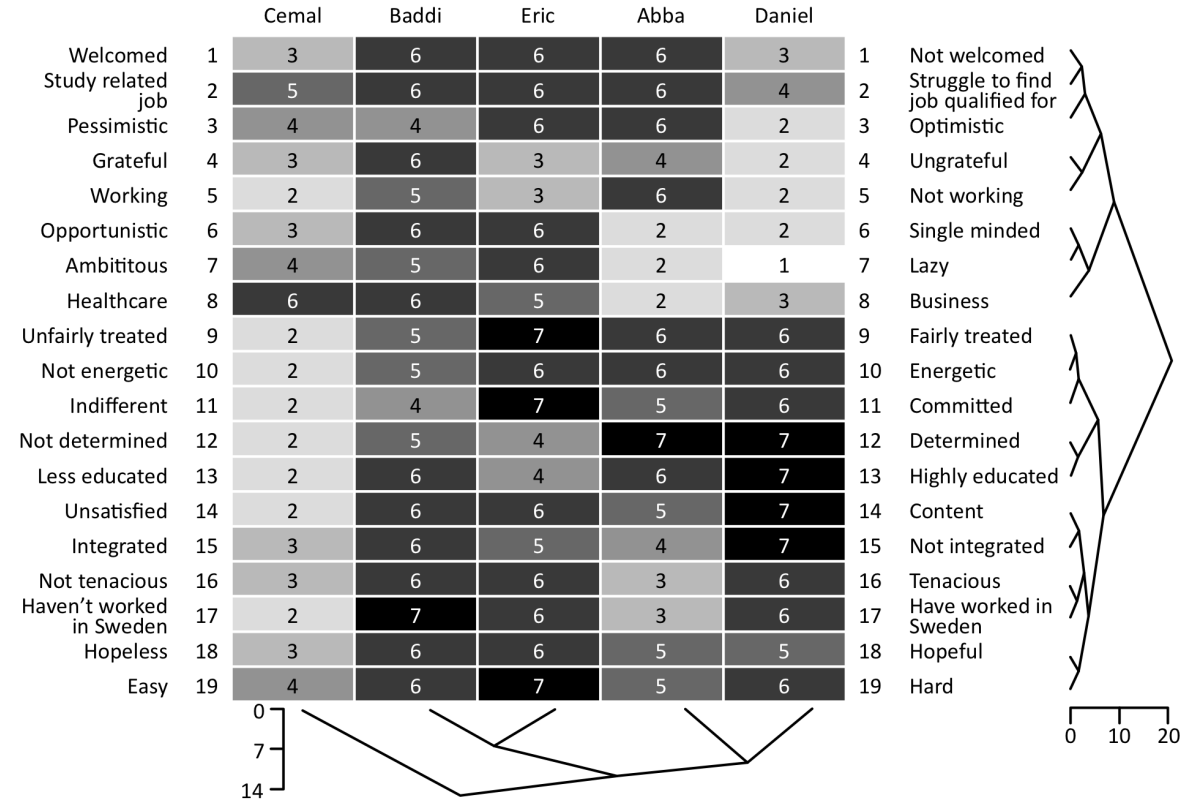

Figure 1. A clustered reordered Bertin plot of how participants scored user vignettes on bipolar constructs.

Figure 2 depicts a biplot, where two sets of points are being presented by their scalar products in the rows and columns of a matrix (Greenacre, 2010). The biplot was chosen due to its ability to use information from different samples and variables of a matrix and present it in a singular graph. The graph shows the factorization of a target matrix M into the product of two distinct matrices A and B, where the scalar products of the vector pairs in the rows of matrix A and matrix B are equal to the elements of the matrix M (Greenacre, 2010). Vectors from both matrices A and B produce two sets of points, one of which provides the vectors and axes of the matrix M, and one which provides the biplot points. The result is a combined plot where patterns between the constructs and the elements can be uncovered and seen based on their geographical distance. The closer to each other two users are, the larger their similarity is and vice versa. The two dimensions of the biplot resume 77.7% the total variance of the dataset (dimension 1 with 55% and dimension 2 with 20.7%).

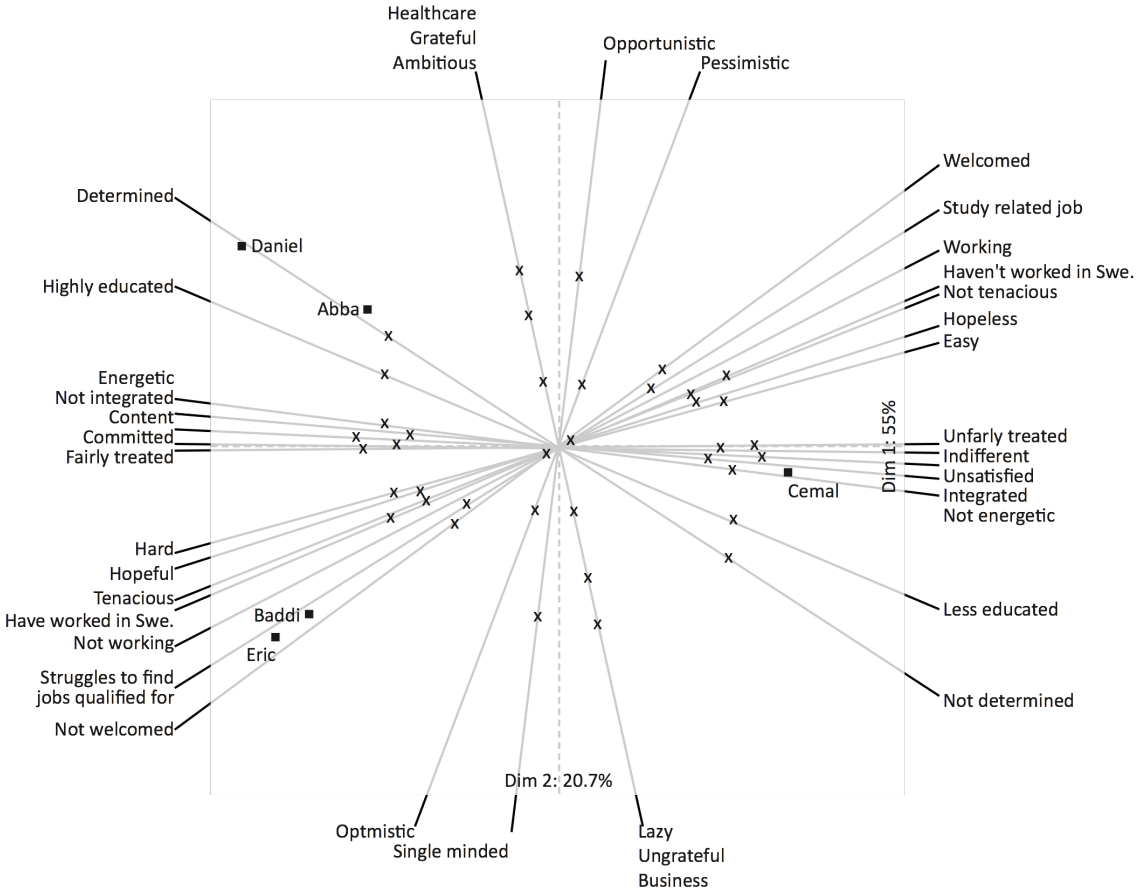

Figure 2. A Biplot showing the users in black inside the plot, and constructs around the edges.

For the positive end of each bipolar construct, a bottom-up categorization was performed. The constructs were placed into categories based on their semantic similarity and fitting titles were then attributed to the categories. Afterwards, following a methodology analogous to the one found in Tomico et al. (2009), the constructs were attributed dominance and importance values. The value for dominance was measured by taking the relative percentage of each construct category and comparing that with the number of all the constructs that were elicited. Importance, denoting a constructs category elicitation order, was measured by taking the order of each construct minus one and dividing by the total amount of constructs elicited minus one according to the formula by Tomico et al. (2009) (see Formula 1). The lower the number for

importance is the higher its importance and vice versa. The standard deviation is provided to indicate the homogeneity of the construct category.

$$Normalised\ order = \frac{Order - 1}{Total\ constructs\ elicited - 1}$$

(1)

The category titles along with their importance are shown in Figure 3, and dominance ratings in Figure 4. The category names chosen were the ones that best expressed the nature of the constructs that were placed in each of the categories. *Personality and traits, Life situation, Qualifications*, and *Goals and dreams* were the names used to represent the construct categories.

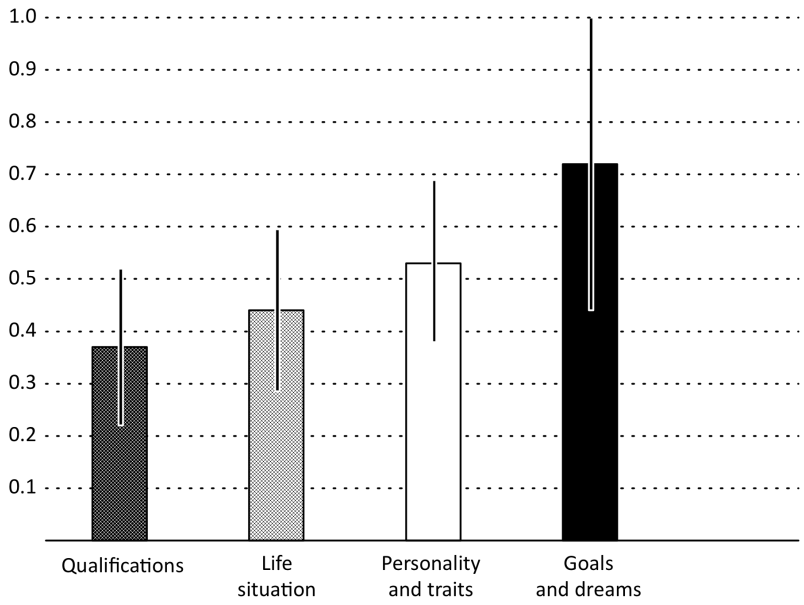

Figure 3. Importance, that is the elicitation order of each construct category (along with the standard deviation in the error bars). The lower the score for importance is, the more important it is and vice versa.

Qualifications had the highest Importance with a rating of 0.37 (*SD* = 0.30). *Life situation* had the second highest importance with a rating of 0.44 (*SD* = 0.31). *Personality and traits* had a rating of 0.53 (*SD* = 0.31), and *Goals and dreams* had a rating of 0.72 (*SD* = 0.28).

Personality and Traits had the highest score on dominance, with 60% of the constructs created in that category. *Life Situation* had the second highest dominance rating with 26% of the constructs being in that category while *Qualifications* had 8%, and *Goals and dreams* had 7% of the constructs. Interestingly, the category that was highly dominant did not have the highest importance, and the most important category did not score high in dominance.

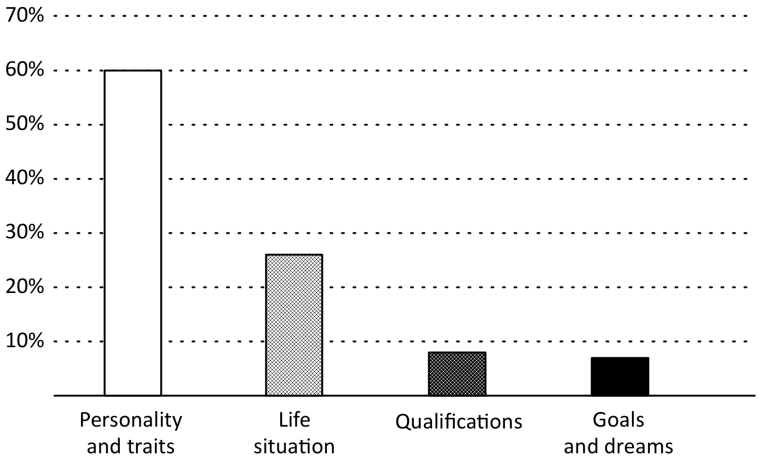

Figure 4. Dominance, i.e. the percentage of constructs created for each category shown next to the category names. Larger percentage means that it is more dominant.

4 Lessons Learned

The main lesson learned from this explorative case study is that the Repertory Grid Technique has potential use in user modeling. The technique, which we call User Repertory Grid, can be used given a crowdsourced pool of participants, as well a more traditionally selected group of participants. The main potential use of the technique is in the creation of personas. Goodwin (2011) presents a ten-step methodology for persona creation. In her process, identifying demographic variables, mapping those variables to interviewed subjects, and finding patterns are steps that can be facilitated by a User Repertory Grid. Based on the clustered and rearranged Bertin plot (Figure 1) and the biplot (Figure 2) for example, three personas can be identified: one representing Cemal, one representing Eric and Baddi; and one representing Abba and Daniel. In the user research which this case study is based on, only one persona was created (Linder & Arvola, 2017). That is a decision that can be questioned in the light of the User Repertory Grid. The identification of the personas is based on not only qualitative, but also quantitative data, and this facilitates the identification of personas.

Another potential use for the User Repertory Grid is in the development of user profiles instead of personas. A user profile is a depiction of an individual user that has been interviewed and is presented with some sort of narrative. Some people call such user profiles personas (Chang et al., 2008), but that is only confusing the terminology. Each of the five users interviewed in this case study could become a separate user profile, with the vignettes as narrative description. The constructs and the ratings from the User Repertory Grid, could be used to communicate the idiographic data of each user profile within the design team and to stakeholders.

It has been argued that Interpretative Phenomenological Analysis can be a potential method for user research (Linder & Arvola, 2017). One of the more challenging steps in such an analysis is to find connections between interviewed individuals. The User Repertory Grid can facilitate this particular step by providing construct elicitation and a rating of individuals on those constructs.

There are also weaknesses to the User Repertory Grid. The first is that in crowdsourcing, we neither have control of who the participants are, nor what the environment in which they work is like. It also takes a substantial effort for the participants to complete their analysis, and they found it harder to find new constructs towards the end of their task. We should also note that the participants are not professional designers or user researchers. This means that they may identify constructs that are irrelevant for the design project. For example, it is critical to include goals and behavior patterns in a persona (Cooper, 1999; Goodwin, 2011), but these were neither dominant nor important in our data. A way to counter that could be that the participants would be provided with constructs that the user researcher or designer chose as important and have the participants rate those constructs, minimizing thus the effort needed to complete the task and having constructs that are relevant for persona creation according to Cooper (1999) and Goodwin (2011).

The results of the User Repertory Grid technique are heavily dependent on the quality of the user vignettes. This means that it will require considerable user research expertise to create good vignettes that include all information that is relevant for the particular design project (goals and behavior patterns included). This is in turn dependent on having a good sampling of interviewees, and well-performed interviews (Goodwin, 2011).

5 Conclusions

We have in developing the User Repertory Grid technique explored the potential use of crowdsourcing in the analysis of user research. Our ambition of utilizing the Repertory Grid Technique in user modelling was to reduce the subjectivity inherent in persona creation. However, the subjectivity of experts is only substituted by a subjectivity of the crowd. The User Repertory Grid will reflect not only what the data on users can tell us, but also the assumptions and preconceptions of the participants. This implies that there is a risk of stereotyping users. There is no escape from subjectivity.

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