Designers' Perceptions of Methods of Involving and Understanding Users

Joy Goodman, Susannah Clarke, Patrick Langdon, and P. John Clarkson

Engineering Design Centre, University of Cambridge, Cambridge, UK
{jag76,sgc32,pml24,pjc10}@cam.ac.uk

Abstract. Numerous methods have been developed to help designers to understand and consider the needs and desires of end-users, but many have had limited uptake in design practice. In order to understand why this is and to enable the development of more effective methods and tools, it is important to uncover how designers themselves think about and react to these methods. We are therefore currently conducting a card-sorting study with designers. We aim to uncover their perceptions of underlying similarities and relationships between design methods, and relate them to the frequency and enjoyment of use. This paper presents results from an initial sample of six designers. A cluster analysis identified a very strong clustering in these results, indicating that common underlying views about methods do exist. Six key clusters are identified, including two focused on user involvement and one on understanding users without direct user contact. The effect of different method characteristics on the frequency and enjoyment of method use are also considered. Initial results indicate that certain clusters of methods are used more often, as are methods that are informal and cheap.

1 Introduction

In design, it is important to keep in mind the needs and desires of the end-user if products are to be produced that these users will find useful and usable in practice [9]. This becomes essential in universal design because of the special needs of many of the end-users and the extra challenges they face in using products. However, this can be very hard to do. Designers are often young and able-bodied and can find it difficult to understand and remember the characteristics of people in very different life situations with different needs, abilities and desires [6].

Many methods have therefore been developed for both involving users directly and helping designers to understand and empathise with users' situations. However, many of these methods have had a mixed and limited uptake in design practice (c.f. [5]). We previously carried out a literature review [7], finding various reasons for this, such as a lack of resources and uncertainty about the methods' usefulness and their effect on design. In particular, one of the key explanations is that there is often a poor fit between the (perceived) nature of the techniques and the ways in which designers think and work [4].

C. Stephanidis (Ed.): Universal Access in HCI, Part I, HCII 2007, LNCS 4554, pp. 127–136, 2007.

It is therefore important to uncover more about what designers think about and how they react to a variety of methods, particularly those for understanding and involving users. Understanding more about how designers perceive and respond to methods can help us to identify those techniques that fit well with the ways in which designers think and work. This will help us to produce, adapt and present methods in more suitable ways. As a result, methods of user involvement will be more likely to be used in practice.

We are therefore conducting a study of designers' response to a variety of design methods, using card-sorting techniques in an interview setting. We involve a range of methods from across the spectrum of design methods and techniques because this enables an understanding of how methods of involving and empathising with users fit into the wider picture of design practice.

This paper presents some results from an initial sample of designers, as part of this on-going study. After discussing related work, we describe how the study was conducted, before presenting and discussing the results.

2 Related Work

Many researchers and designers have created frameworks for thinking about and categorising design methods. These frameworks are often based on the authors' experience and knowledge of the methods and the design process (e.g. [1,10]), or on studies of commonly-used methods and their characteristics (e.g. [3]).

These categorisations provide helpful ways of viewing design methods, but it is important to supplement them with an understanding of how and what designers themselves think about the methods, so as to ensure a good fit with their ways of thinking and working.

There has been some research looking at designers' response to methods. For example, Stanton and Young asked participants to rate ergonomics methods on various dimensions chosen by the researchers [13]. These studies, however, did not examine designers' own perceptions of what is important in categorising methods or their views of the underlying relationships between methods. The study described in this paper therefore adds to our understanding of designers' ways of thinking and working, and thus enables the production of methods and sets of methods that fit better with design practice.

3 Method

3.1 A Representative Set of Design Methods

A large number of design methods, tools and techniques were identified through a literature review of publications from fields such as product design and development, HCI, engineering design and ergonomics. We searched for descriptions of methods for use at any part of the design process, including but not limited to methods that consider users explicitly. Several collections of methods were particularly useful (e.g. [1,11,12]), but many others were also helpful, yet cannot be listed here for reasons of space.

We identified over 330 methods and techniques for use in design. As this was too large a set to present to designers, a smaller subset was chosen. To ensure that this subset covered a representative range, we categorised the methods according to type (e.g. Analysis, Decision making, Ethnographic). We then selected representative methods of each of the main types, with an emphasis on methods for involving and understanding users, since this was the focus of the study. The categorisation was used solely to ensure a representative selection, not to create an underlying structure to the set. Alternative criteria for categorisation were considered; the type of method was chosen as being best for ensuring a wide and representative range of methods.

The selection of methods was cross-checked and refined by other experts in the field, resulting in a final selection of 57 design methods and techniques, which can be seen in the table of results in Table 1 in Section 4.

Each method was then described on a card, along with alternative names for the same or very similar techniques, as shown in Figure 1.

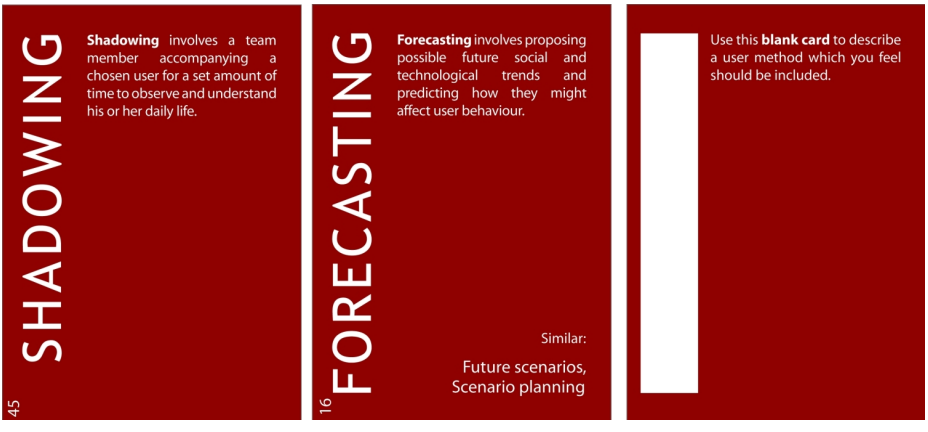

Fig. 1. Examples from the set of design methods cards used in the study

3.2 Interview Procedure

Participants were interviewed individually. After an explanation of the purpose of the study, they were given the set of design methods cards described above. Blank cards (on the right in Figure 1) were provided so that participants could add additional methods, if they felt any were missing. They could also add new labels to cards. Participants were then asked to group the cards using two card-sorting exercises as described below.

Unconstrained Card Sort. Firstly, the participants were asked to sort the cards into groups that made sense to them. They could use any criteria they liked to do so and could use any number of groups, sub-dividing them if desired. Once they had done this, they were asked to label the groups and sub-groups, as shown in the example in Figure 2.

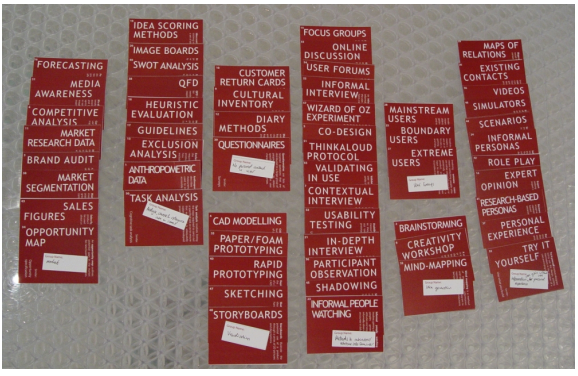

Fig. 2. A completed unconstrained card sort from the study

Guided Card Sort. Participants were then asked to place the cards on the grid shown in Figure 3, thus sorting them on two criteria: how often they used the methods and how much they felt they would enjoy using them. Methods were rated simulataneously on the two criteria, rather than on each separately, to reduce the length of the interview.

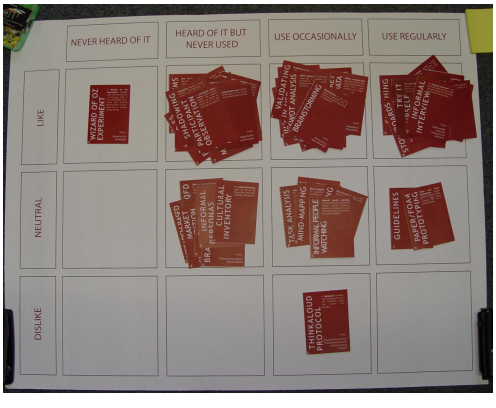

Fig. 3. The grid used for the guided card sort

4 Results and Analysis

4.1 Unconstrained Card Sort

An example of the groupings produced by the participants is shown in Figure 2. By examining the group labels given by the participants, we can gain an idea of the underlying criteria they used to group the methods. It seems that four of the participants grouped methods primarily according to their type or function (e.g. “Roleplay”, “Market” and “For Structuring Design Ideas”). The remaining two grouped them principally by the stage of the design process when they were most

commonly used (e.g. "Context and Situation", "Conceptual Design" and "Developing the Idea"). However, a mix of sub-criteria were often used by the same participant and there were some types of groups that were common across the whole sample.

Table 1. Clusters of methods identified by the cluster analysis

Cluster A: User involvement 1: More active involvement	Cluster B: User involvement 2: Getting information from users
Usability evaluation Validating in use Diary methods Participant observation Focus groups User forums Co-design Involving boundary users Involving mainstream users Involving extreme users Informal interview Informal people watching	Cultural inventory Customer return cards In-depth interview Questionnaires Shadowing Thinkalouds Wizard of Oz experiment Contextual interview Online discussion groups
Cluster C: Knowledge of the market Brand audit Demographics Market segmentation Media-awareness Opportunity map Sales figures Competitive analysis Forecasting	Cluster D: Understanding users without user contact Role play Try it yourself Videos of user needs Informal personas Research-based personas Scenarios Involving existing contacts Personal experience Expert opinion
Cluster E: Visualisation and prototyping Idea scoring methods Image boards Sketching Storyboards CAD modelling Rapid prototyping Paper/foam prototyping Maps of (interpersonal) relations Simulators	Cluster F: Idea generation and analysis Anthropometric data Guidelines Heuristic evaluation Task analysis Brainstorming Creativity workshops Mind mapping Exclusion analysis SWOT analysis Quality Function Deployment (QFD)

Cluster Analysis. Cluster Analysis is an exploratory statistical technique that is traditionally used to group and classify objects in a dataset. It was applied to the results of the card-sort to uncover the participants' common perceptions of underlying similarities and relationships between the methods. For this initial dataset, we examined only the highest-level groupings given by participants. So, if a participant

placed method M1 and M2 within two different sub-groups of, say, "Brainstorming", they were considered to be in the same group in that participant's results. When further data is available from more participants, we hope to run analyses on the sub-groups as well.

Cluster analysis was run using two types of linkage methods (complete linkage and Ward's method) to establish the stability of the clustering over different linkage rules. The two methods identified very similar clusters, indicating a stable clustering with six clear clusters, as shown in Table 1. Clusters A and B were closely related, as were clusters E and F. These clusters were then named by the researchers, based on an examination of the methods within each cluster.

Table 2. Most common locations of methods in the grid sort. Abbreviated method names are used and letters indicate the clusters that methods belong to.

	Never heard of it	Heard of it but never used	Use Occasionally	Use Frequently
Like	Maps of relations (E) Research-based personas (D) Wizard of Oz experiment (B)	Focus groups (A) Boundary users (A) Extreme users (A) Participant obs (A) Sales figures (C) Usability eval (A) Videos of users (D)	Contextual interview (B) Creativity workshop (F) Demographics (C) Diary methods (A) Image boards (E) In-depth interview (B) Informal interview (A) Informal people watching (A) Mainstream users (A) Opportunity map (C) Shadowing (B) Validating in use (A)	Brainstorming (F) CAD modelling (E) Co-design (A) Competitive analysis (C) Expert opinion (D) Existing contacts (D) Media-awareness (C) Mind mapping (F) Paper/foam prototypes (E) Personal experience (D) Rapid prototyping (E) Scenarios (D) Sketching (D) Storyboards (E) Task analysis (F) Try it yourself (D)
Neutral	Cultural inventory (B) QFD (F)	Role play (D)	Idea scoring (E) Market segments (C) User forums (A)	Guidelines (F) Heuristic eval (F)
Dislike				
No agreement	Anthropometric data (F) Customer return cards (B) Informal personas (D) Simulators (E) SWOT analysis (F) Thinkalouds (B)		Brand audit (C) Exclusion analysis (F) Forecasting (C) Online discussion groups (B) Questionnaires (B)	

4.2 Guided Card Sort

The method cards were placed by participants on the grid shown in Figure 3 and the most common category for each method is shown in Table 2. The majority of

methods were placed in the first row, indicating that these methods were "liked". Few methods were placed in the row labelled "Dislike"; in fact, only 16 of the 57 methods were placed in this row by even one participant.

Methods from Cluster A were mostly placed in the columns "Never used" and "Use occasionally". Some of Cluster B's methods were also placed in these columns, but Cluster B also contained some methods that participants had not heard of and some that they did not agree about. Only one method from Clusters A and B was most commonly placed in "Use Frequently". Indeed, the methods in this column were almost all from Clusters D, E and F.

Most methods were placed in the row "Like". Of those rated "Neutral" (or "Dislike"), methods from Clusters C and F predominate (this is more pronounced when examining the most common placement along the "Like" axis only). This observation is tentative and awaits data from the fuller study for confirmation. In particular, there is some indication that it only applies to some of the sub-clusters of Cluster F, but fuller analysis on the sub-groupings is needed to clarify this.

In order to estimate the effect of methods' formality and cost (in terms of both money and time) on their use and on designers' preferences, we roughly rated each method according to these two criteria. This initial rating was done quickly, based solely on the authors' opinions and therefore only gives a rough indication. We plan to conduct more reliable analysis on the full dataset using ratings obtained from a selection of independent experts.

Based on these initial ratings, it seems that:

- The methods used frequently are mostly informal and cheap.
- Methods that are disliked are more often formal, and ones that are liked are more often informal, but this is unclear.
- Expense has little effect on whether designers like methods; in fact, most of the expensive methods were liked.

5 Discussion

5.1 Types of Groupings

There were two main underlying criteria used to group the methods: the methods' type or function, and the stage of the design process where they were most commonly used. These reflect common ways of thinking about methods in the design community, and they were used as the key grouping criteria by two distinct sets of participants.

In this initial study, there are insufficient people in each set to examine differences in their responses in detail. Nonetheless, the existence of two separate sets indicates that there are key differences in the ways in which different designers think about methods. In addition, some common ways of thinking are identifiable, with some groupings being common across the whole range.

We conclude that it is unlikely that a single way of structuring method sets or a single type of method that will appeal to all designers, although there are some commonalities that will be helpful. Flexible ways of navigating method sets and selecting methods may be needed.

5.2 Identified Clusters

Six clusters were identified, as shown in Table 1. The methods of user involvement are grouped together in Clusters A and B, and there is also a distinct cluster (D) dealing with understanding the user without direct user involvement. This indicates that designers often think of user methods separately, rather than as parts of other elements of design, such as idea generation or understanding the market. Perhaps there is a need to help designers to see user methods more as a natural part of the key components of design. We want designers to naturally reach for users and user information when they want inspiration, understanding of the market or analysis of their concepts.

Within user methods, there is a clear distinction between those that directly involve users (A and B) and those that enable understanding of the user without direct involvement (D). There is also a less clear differentiation between those that simply get some information or response from the user (B) and those that involve the user more actively in the process (A). These categorisations begin to help us understand how we might structure sets of user methods. Further insight will be gained from our extended study and cluster analysis on the more detailed groupings used by participants.

5.3 Preferences and Frequency of Use

There was a generally positive attitude towards design methods, with few methods being listed under "Dislike". This indicates a degree of openness to a wide range of design methods and techniques. However, caution should be exercised because it may also reflect a bias in participants' responses, perhaps from a desire to please the interviewer. Despite this bias, we can still obtain some useful information about participants' preferences for methods, by examining the methods' relative positions. In particular, there is an indication that participants may like methods from Clusters C and F *less* than methods from other clusters. However, more data from the fuller study is needed to confirm and clarify this.

As well as designers' preferences, we examined frequency of use. The most commonly used methods tended to come from clusters D (Understanding users without user contact), E (Visualisation and prototyping) and F (Idea generation and analysis). In particular, methods for understanding users without user contact were used more often than methods of direct user involvement.

The continuation of this study will help to uncover why these clusters are more popular, but possible reasons include that designers may see these methods as more essential to the design process, or that they are more traditional, deeper-rooted, less formal or cost less to implement. It does not seem like there is a correlation between the extent to which methods are liked and whether or not they are used; for example, it seems that user methods are often liked but not often used.

Some insight can be gained from previous studies of commonly-used methods. In particular, Bylund et al [3] highlight the need for methods to fit with a company's "modus operandi" and Brusberg and McDonagh-Philp suggest that commonly used methods tend to be those that can be adapted and "used in an intuitive and iterative

manner" [2]. Our previous studies of designers' practice also identify a tendency to use informal, quick and cheap methods, particularly in early stages of the design process [8].

Our initial ratings of methods according to formality and cost back this up, indicating that more commonly used methods tend to be informal and cheap and that designers tend to prefer less formal methods.

6 Conclusions and Future Work

The initial results of our study show a strong and stable clustering in designers' grouping of methods, indicating that common perceptions of underlying similarities and relationships between methods do exist. This therefore lays the ground for a fuller study and more in-depth analysis.

The initial analysis identified six clear clusters: "Active user involvement", "Getting information from users", "Knowledge of the market", "Understanding users without user contact", "Visualisation and prototyping"; and "Idea generation and analysis". This provides insight into how to structure method sets and develop methods so that they fit with designers' existing thought and work patterns. However, further detail is needed, which we hope to gain from future work.

Commonly used methods tended to come from the latter three clusters, and initial ratings of methods according to formality and cost indicate that more commonly used methods tend to be informal and cheap and that designers tend to prefer less formal methods. Again, further work is needed to obtain more reliable results.

We therefore plan to extend the study to include 15 to 20 designers, from a better balance of design disciplines, including communications design. With more participants, we will be able to investigate whether there are differences between responses from different design disciplines. It will also be possible to identify sets of participants who use different key criteria in their sorts and examine the differences in their resultant groupings. We also plan to conduct more in-depth analysis, examining participants' lower-level groupings of methods, in order to identify more detailed clusters of methods.

We hope that the resultant greater understanding of designers' perceptions of underlying similarities and relationships between design methods will enable the development of more effective methods and tools for considering users in design.

Acknowledgements. This study was funded by the EPSRC as part of the i~design 2 project. We would also like to thank all the participants in the study.

References

1. Aldersey-Williams, H., Bound, J., Coleman, R. (eds.): The Methods Lab: User Research for Design, Design for Ageing Network. (1999) (Accessed: February 5, 2007), Available at: http://www.education.edean.org/index.php?filters=f&card_id=80&row=1&query=methods%20lab

2. Bruseberg, A., McDonagh-Philp, D.: Focus Groups to support the Industrial/Product Designer: A review based on current literature and designers' feedback. Applied Ergonomics 33(1), 27–38 (2002)
3. Bylund, N., Grante, C., López-Mesa, B.: Increasing the usability in industry of methods from design research. In: ICED 2003. Stockholm: The Design Society (2003)
4. Cardello, A.V.: Terminology, reliability, validity, and subjectivity in the search for the "voice of the consumer". Food Quality and Preference 16(3), 203–205 (2005)
5. Cardoso, C., Clarkson, P.J., Keates, S.: Can Users Be Excluded from an Inclusive Design Process? In: Proceedings of HCII 2005, Las Vegas (2005)
6. Eisma, R., Dickinson, A., Goodman, J., Mival, O., Syme, A., Tiwari, L.: Mutual inspiration in the development of new technology for older people. In: Include 2003. London: Helen Hamlyn Research Centre, pp. 7:252-7:259 (2003)
7. Goodman, J., Langdon, P.M., Clarkson, P.J.: Providing Strategic User Information for Designers: Methods and Initial Findings. In: Designing Accessible Technology (Proceedings of CWUAAT 2006), London, Springer, London, Heidelberg (2006)
8. Goodman, J., Langdon, P.M., Clarkson, P.J.: Equipping Designers for Inclusive Design. Gerontechnology 4(4), 229–233 (2006)
9. Griffin, A.: Obtaining customer needs for product development. In: Rosenau, et al. (ed.) Rosenau et al.The PDMA handbook of new product development (Chapter 11), pp. 153–166. John Wiley and Sons, New York (1996)
10. Hanington, B.: Methods in the Making: A Perspective on the State of Human Research in Design. Design Issues 19(4), 9–18 (2003)
11. Hom, J.:The usability methods toolbox. Update date: 10 June 1998. (1998) (Accessed: February 5, 2007), http://jthom.best.vwh.net/usability
12. IDEO, IDEO Method Cards. Palo Alto, IDEO (2003)
13. Stanton, N., Young, M.: Is utility in the mind of the beholder? A study of ergonomics methods. Applied Ergonomics 29(1), 41–54 (1998)