

Chapter 5

Providing Strategic User Information for Designers: Methods and Initial Findings

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5.1 Introduction

This paper reports initial findings from part of the EPSRC funded i~design project, addressing the usability of user data during the inclusive design process. In order to provide useful user information, it is important to understand how designers work and how they use such information. We, therefore, report a set of findings from a literature review on this topic and describe how this review fits into a longer-term integrated methodology, as a first stage in a convergent approach. We describe the context and role of this work in the overall project and illustrate how the questions and considerations that were yielded by the literature review will act as input to the next observational stage. In addition, we consider the implications of these initial findings for communicating with designers.

5.1.1 Background

There is an increasing acknowledgement of the importance of making designs accessible to the wider population including older and disabled people. The ageing population in developed countries, such as the UK, means that this is a large and increasing group (U.S. Census Bureau, 2005) and one with considerable spending power (Coleman, 2001). In addition, legislation such as the Disability Discrimination Act (DDA) in the UK requires companies to consider the needs of these user groups because both older and disabled groups are disadvantaged and hampered in their use of everyday products due to functional demands beyond their capabilities (Keates and Clarkson, 2003). There is, therefore, clearly a drive to develop more inclusive design solutions (Yelding, 2003) that address users' wants and needs during the design process. However, companies and their designers do not always know how to meet these needs. There is a lack of clarity about the characteristics of the user population, and a lack of knowledge about how to

address these in design. If there are going to be truly accessible and usable products in the marketplace, it is imperative to provide companies and designers with more information and guidance on inclusive design.

In order to provide information and guidance that are really usable to the product designer it is necessary to establish the nature, timing and value of the diverse forms of information that are required. In particular, it is unclear what balance is required between methods of obtaining user data that involve direct observation of users such as focus groups, and those that provide data about users such as statistics, introspection and expert audit. Appropriate information and guidance needs to be tailored to designers' work contexts, practices and ways of working. We need to understand what information and methods designers currently use, what characteristics aid in their adoption, and which methods fit well or badly with their work practices (Goodman *et al.*, 2005).

5.1.2 Context

The i~design project, funded by the UK Engineering and Physical Sciences Research Council (EPSRC), seeks to better enable industry to design products that can be used effectively by the population as a whole, including those who are older or disabled. This project focuses on how to put inclusive design into practice in a commercial setting, aiming to merge separate tools and techniques into an integrated holistic approach and to bridge the gaps in the flow of information about users, identified in earlier work on the tools and techniques of inclusive design (Keates and Clarkson, 2003) (see Figure 5.1).

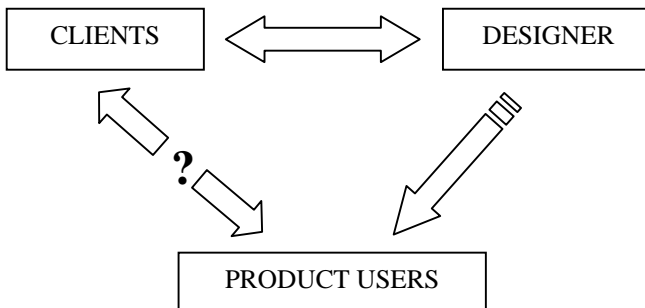


Figure 5.1. Clients talk to designers but there is little communication with users

The current phase of the research aims to investigate the balance between involving users and using data in the design process. An essential element of this is a deeper understanding of designers' work practices including the methods they currently use to inform design and those they would be open to in terms of cost, resources and existing practices. The final objective is to develop a framework for guidance during the design process, in particular for guidance on the choice of methods of acquiring user data and the usefulness and accuracy of the result for differing stages of the design process.

5.2 Methodology

In this paper, we present the first stage of our investigation, part of an approach using a convergent methodology. In this approach, we use a number of research methods that are, in principle, capable of independent results, to address the same set of research questions. Each method has its own advantages and disadvantages with respect to objectivity, accuracy and the degree to which it is capable of revealing unobvious features of designers' work practices. Using a convergent approach allows findings to be cross-checked against each other, avoids favouring any one interpretation, helps to balance the disadvantages of the particular methods, benefits from their advantages and obtains a spectrum of views at different levels of objectivity (Langdon *et al.*, 2003).

The particular methods used are shown in Figure 5.2. It is expected that insights from the literature, survey data, interpreted observational data and recorded retrospective interviews with experts can be used together to obtain a rounded picture of design practice and so inform the development of guidance and methods for designers. We have currently carried out the literature review and are conducting the survey and observational studies.

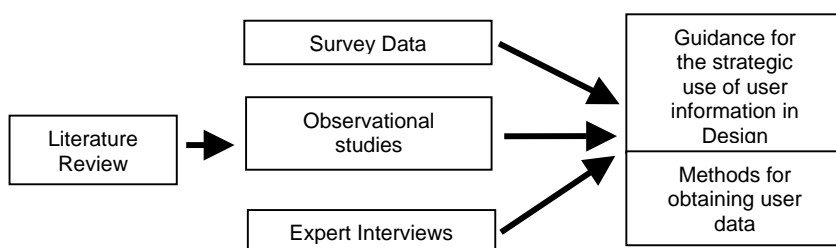


Figure 5.2. The convergent approach to project methodology

5.2.1 Literature Review

As a first step, we have carried out a review of the diverse literature on designers' work practices, from fields such as HCI, engineering design, product design, social science, methodology and psychology. As well as the published literature, we have drawn on raw data from studies carried out on parallel projects (Crilly, 2005; Lebbon, 2005). A summary of the findings is given in Section 5.3.

5.2.2 Observational Study

Using findings from the literature review and earlier projects to define structured questions, we are conducting an observation and interview study of the six design teams involved in the 2005 Design Business Association (DBA) Design Challenge

(DBA, 2005). This is an annual competition, organised by the DBA in association with the Royal College of Art, challenging teams to work with disabled users over a period of about six months, to create examples of inclusive design. Three of this year's teams lie in product design and three in communication design.

Audio and visual data is being collected through observing these teams' design process in formal meetings and interactions with users. We particularly focus on teams' interactions with disabled users, the information used and how this affects the design process. Three of the teams are investigated in more detail. They were selected to represent both product and information design and to spread previous experience of the DBA challenge through employee migration. These teams are being tracked in detail, with semi-structured interviews on their design processes and methods and further observations of team meetings. Informal and workday team member interactions when researchers are not present are captured using retrospective interviews, audio diaries and phone interviews. This challenge presents a unique opportunity to track the processes of three different companies from start to finish of a design, within a manageable time-span, as well as to observe the effect of interaction with disabled users upon this process. This also allows the possibility of examining the relationship between company type, experience and background and the use of design data.

5.2.3 Surveys

To complement this detailed data on designers' behaviour, we are currently conducting a survey into awareness of, barriers to and motivations for inclusive design in companies across the design, retail and manufacturing sectors in the UK. This should yield a more generalisable quantitative statistical perspective on design companies' attitudes towards inclusivity in the design process. The information from this survey will also be backed up with data from a small-scale survey carried out earlier in the i~design project (Lebbon, 2005). Preliminary results from the survey can be found in (Goodman *et al.*, 2006a, 2006b).

5.2.4 Expert Interviews

To complement the survey, literature and observational data and to facilitate the comparison of findings, detailed interviews will be carried out with an expert DBA challenge facilitator, who has selected, briefed and assisted company teams during the challenge for six years. Her role, in particular, has been to introduce teams to the use of observational user data during critical user forums, about midway through the challenge period. This involves exposing the teams to users of products and encouraging them to engage with the lives and capability limitations of these "disabled" forum volunteers in their specific design area (Dong *et al.*, 2005).

5.2.5 Convergent Methodology

The weaknesses of these various methods will be taken into account when comparing and contrasting their outputs. These weaknesses include the unrepresentative nature of the DBA challenge; effects of knowledge of recording during observations; and possible interpretation biases during data segmentation and analysis. Likewise we expect sampling bias, statistical non-representativeness and self-selection biases to affect the survey data. The expert interviews will reflect the participants' biases and weaknesses of memory as well as revealing key insights. The use of a convergent methodology allows an analysis of common findings, the elimination of artefacts resulting from the weaknesses of specific methods and the recording of a spectrum of views at different levels of objectivity.

5.3 Literature Review: Abbreviated Results

This section reports results from the literature review, the first stage of the convergent approach, as described above. These results identify key research themes and specific issues, which will be addressed in the later stages of the investigation.

5.3.1 The Design Process

It is common for descriptions of both the engineering and product design processes in the literature to divide them into a series of stages or phases. While there are some arguments against such a division (Baxter, 1995), the general consensus seems to be that this does indeed describe important aspects of the design process, despite evidence for non-linearity and iterative sub-processes (see Section 3.1.2).

5.3.1.1 Main Phases of Design

Many different design phases are suggested in the literature. However, many of these are similar and can be categorised roughly into six stages, ordered as follows: briefing/defining the problem or opportunity; analysis/data collection; creativity/synthesis; development/prototyping; evaluation/testing; and manufacturing.

How these occur in practice can be illustrated by typical findings. Powell (2005), for example, describes the following design stages: Briefing; Research into social, economic and technological context to establish market relevance; Strategic enquiry and orientation; Idea generation and innovation; Concept design; Concept development; Design development; Further phases and liaison. This illustrates how specific descriptions of the design process fit broadly into the above categories but not in a strict or prescriptive way.

5.3.1.2 Characteristics of the Design Process

In addition, design is not always carried out in the strict linear sequence the above description might suggest. Rather it tends to be iterative, cycling repeatedly

through some of the phases and back-tracking to earlier phases (Budgen, 1994). It can also jump around between phases in a less ordered fashion (Restrepo and Christiaans, 2003). What is more, different companies and designers have individualised approaches to design (Lebbon, 2003), though they often still fit into the general, broad set of stages described above (Choueiri, 2003). As well as this, the design process is characterised by a high use of creativity (often specific moments of creativity) (Choueiri, 2003), intuition (Bruseberg and McDonagh-Philp, 2002) and prior experience (Restrepo, 2004).

5.3.2 Design Methods

5.3.2.1 General Design Methods

The literature suggests that a wide range of methods is used in design but that these are not always applied in their formal, accepted form and may be adapted (Bruseberg and McDonagh-Philp, 2002), overlapped and combined according to need. Common design methods, especially in the product design field, include drawing, sketching and modelling (Lawson, 1997; Restrepo, 2004), scenarios (Hasdoğan, 1996) and a variety of subjective and informal techniques, such as the use of previous experience, general guidelines and rules of thumb (Cross, 2000), as well as unfocused browsing (Mival *et al.*, 2004).

5.3.2.2 User Research Methods

Of particular interest for inclusive design are user research practices and methods. There is some variation between disciplines but, again, implicit, subjective techniques dominate, *i.e.* methods such as self-observation, intuition, referring to self-experience or other specialists, looking at related products and obtaining feedback from family and friends (Kotro and Pantzar, 2002).

When more formal methods are used, many designers use the same few methods again and again, whether or not they are appropriate (Cardoso *et al.*, 2005). Particularly common methods early in the design process are questionnaires, interviews and focus groups (Anschuetz, 1996). Later, prototype testing, user trials and checking guidelines are popular (Sims, 2003).

5.3.2.3 Characteristics of Methods

Methods that are commonly used tend to be those that can be adjusted to individual needs and “used in an intuitive and iterative manner” (Bruseberg and McDonagh-Philp, 2002), supporting an informal approach. Also popular are methods that enable designers to visualise their ideas, *e.g.* sketching and modelling. When more formal methods are used, designers seem to prefer a small set of familiar methods. It is also important that methods are suitable for and provide an appropriate level of detail for the current phase of design (Baxter, 1995).

5.3.2.4 Problems with Methods

Various problems with current methods limit their popularity and usefulness. Some formal methods are seen as too “artificial”, while others require too many

resources, such as time, money, staff and expertise or fit poorly with designers' work practices. In addition, designers can be wary of user research in general, afraid that it will constrain their designing, uncertain of its benefits and resistant to change (Bruseberg and McDonagh-Philp, 2002). Other problems arise, not because of the methods themselves but because of designers' poor understanding of them. A lack of documented reliability and validity, and of information on their strengths and weaknesses can make designers wary of using some methods (Cardello, 2005). When they do use them, the methods are not always applied appropriately or consistently and are often applied in inappropriate situations, leading to "disappointing results and mistrust of methods in general" (López-Mesa and Thompson, 2003).

5.3.3 Information Use

Designers use information in an opportunistic fashion, to complete or confirm facts, to stimulate creativity and occasionally to meet a lack of knowledge (Restrepo, 2004). In addition to that obtained from their own research, formal information about users often comes from sources such as the client (Sims, 2003), a marketing or research department (Hasdoğan, 1996) and published paper and electronic documents (Powell, 1987).

5.3.3.1 Information Formats

Information formats that are commonly used tend to be those that are flexible, familiar and accessible, such as people, paper and product examples. People, especially colleagues and experts, are referred to because they can translate their knowledge to fit designers' requirements (Restrepo and Christiaans, 2003) and because consulting them is "quick and dirty" and can provide a wide range of different kinds of information and build empathy (Cassim, 2005). In engineering design, 24% of a designer's working day was engaged in the acquisition or provision of information and on 90% of these occasions they obtained the information through reference to their colleagues (Marsh, 1997). A comparative study of the outcomes of the US Universal Design Research Project (UDRP) (Vanderheiden, 1998) and the UK Design Business Association (DBA) Design challenge (Cassim, 2005) identified commonalities of findings that included the need for the development of design tools and the generation of statistical and market data for easy reference (Dong *et al.*, 2004).

Paper, in the form of trade and product literature, is used because it is considered reputable, in a format useful for design (Powell, 1987), easily accessible and up-to-date (Rhodes, 1998). Product examples and case studies are also considered to be easy to understand, to use designers' "language" and to be inspirational, enabling one to get an impression of styles, trends and techniques (Rhodes, 1998). Visual formats are better than ones heavy on text, particularly in more creative industries, such as product design, which attract significant proportions of people with dyslexia (Cassim, 2005). Melican found that designers like to form their own concepts of users. They need information that is easy to use

and allows them to frame the user interaction in their own way. Both quantitative and qualitative information can be useful for design (Melican, 2000).

5.3.3.2 Problems with Information

Sometimes information supplied to designers is not used. Designers may not use information because they themselves have poor or incorrect representations of the design problem and lack awareness of what information there is or why they need it. They can have a tendency to rely on previous knowledge instead of seeking new information. They may be unwilling to use the information or to change their ideas, and may be unable to transfer the information to their designs. (Powell, 1987; Restrepo, 2004). Some information, however, is not used because of problems with its content or presentation. Common difficulties with its content include poor quality, an unfamiliar and untrusted source and perceived irrelevance (Restrepo, 2004). Another common problem is that the information simply suffers from poor accessibility, *e.g.* it has a poor format or is too text-based (Restrepo and Christiaans, 2003). It may be presented at the wrong level of detail (Restrepo, 2004), be too academic (Morris *et al.*, 2004), too filtered (Crilly, 2005) or buried in other information. It can also come across as too authoritarian (Morris *et al.*, 2004), be hard to get hold of or cost too much (Restrepo, 2004).

5.4 Communicating with Designers

5.4.1 Implications of the Design Process

The design process contains several phases with different characteristics and information needs and it is important to ensure that appropriate methods and information are available for each phase, providing an appropriate level of detail. It is useful to explain what phases each method or piece of information is suitable for, describing the phases in a flexible manner, since different companies use and describe them differently. Design is also characterised by a high use of creativity, intuition and prior experience. Given the high value placed on these and people's reluctance to change, it may be best to support these rather than seeking to replace them. Descriptions of inclusive design methods and information should also avoid any unintentional indications that these features are being replaced.

5.4.2 Implications for Design Methods

Design methods are used very flexibly indicating that a method set or "toolkit" should not provide a neat set of defined formal methods but rather methods that can be overlapped, combined and used in flexible ways. It may be better if such a toolkit is small as designers seem to prefer a small set of familiar methods. If a toolkit is large, then it may be worth-while providing ways of selecting smaller sets, personalised to individual designers, companies or design categories.

When considering individual methods, the problems described in Section 5.3.2.4 show the importance of fit with designers' work practices and budgets and of avoiding artificiality, both in the method itself and in its description. It is also good to remember that implicit and informal methods, like previous experience, general guidelines and rules of thumb, are popular. We should consider how we can support and improve these methods as well as provide replacements. Problems with design methods also arise due to designers' poor understanding of them, what they are and how to apply them. It seems that more information and reassurance about user research in general, more information on individual methods in particular and guidance as to their selection would improve their uptake and use.

5.4.3 Implications for Information Provision

The popular information formats described in Section 5.4.3 provide promising avenues for disseminating information. People, paper (*i.e.* trade literature) and product examples are all useful and well-received formats. When it is not possible or suitable to use them, we can consider how we can replicate their advantages in other formats, for example, translating information to fit particular designers' requirements, enabling quick and easy information access to a wide range of information, encouraging empathy, keeping information up-to-date and using designers' language.

5.5 Conclusions and Future Work

This paper has described the initial results of a literature survey on the design process and designers' work practices, considering practical implications for the provision of information and of design methods, particularly for inclusive design. This survey has provided a rich and extensive source of data about designers' work practices and the use of user data. These results will focus subsequent observation and interview stages and may be considered together with these other methods in a convergent methodology to build a reliable picture of what designers do.

5.6 Acknowledgements

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