

# Formats for User Data in Inclusive Design

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**Abstract.** Although information about users is vitally important in inclusive design, its use is often limited. The literature suggests that this is, at least in part, due to the ways in which the information is provided, which do not always match designers' needs. We therefore conducted a study to discover the information formats that designers do and do not like and use. In this paper, we draw implications for the presentation of design information, suggesting that it should be quick and easy to find and use, visual and stimulating, flexible and open-ended, and relate clearly and concretely to design issues. We also propose two categorisations of information formats and types and discuss the suitability of some specific examples of types of user information.

## 1. Introduction

Information about users is vitally important in the user-centered design of accessible and assistive technology. The users of such technology, who may include practitioners as well as people with impairments, often have a wide variety of capabilities, requirements and preferences that may differ from those in the population as a whole and from those that designers are familiar with [11]. Designers therefore need to be provided with a variety of information about their target users.

Some such information is already available [e.g. 11,19]. However, its use is often limited. For example, Strickler says that "questions regarding how an end user might interpret, interact with, and act on designed communication objects generally have been presumed to be addressed adequately by the designer's intuition" [20].

The literature suggests that this is, at least in part, due to the ways and formats in which the information is provided. It can be difficult to locate [15] and, once found, can be difficult to interpret and use [1]. Lofthouse suggests that information needs to be more suited to designers' needs and should match their ways of working [12].

We therefore report on the results of a study of design practice, drawing on designers' practical design experience and on observations of an annual design competition. We examine whether and how the format and type of information, particularly user information, affects its take-up and use. We draw implications for the presentation of information and propose two categorisations of information formats and types. Some examples of information formats for inclusive design are given and their suitability for designers' use is discussed.

## 2. Methodology of the Study

We carried out a one year study of design practice in product and communications design in order to inform guidance for the development and use of information and methods in design. The study examined a variety of facets of design practice (e.g. design methods and team organisation) and this paper presents findings that relate directly to information use. Further findings about other aspects of the design process, such as design methods and user involvement, are presented elsewhere [6,7].

Our study adopted a convergent methodology, employing a number of research methods that are capable of independent results. Each method has its own advantages and disadvantages with respect to objectivity, accuracy and its ability to reveal non-obvious features of designers' work practices. Using a convergent approach allows findings to be cross-checked; avoids favouring any one interpretation; helps to balance the advantages and disadvantages of the particular methods, and obtains a spectrum of views at different levels of objectivity. The particular methods used are shown in Figure 1. Note that, although survey data was used to build up the picture of design practice as a whole, it focused on industry response to inclusive design [7] and so is not closely related to the topic of the current paper.

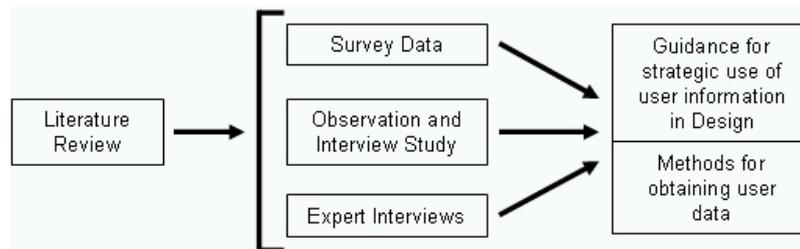


Fig. 1. Overview of methodology

### Literature Review

As a first step, we carried out a review of the literature on designers' work practices, from fields such as HCI, engineering design, product design, social science, methodology and psychology.

### Observation and Interview Study

An observation and interview study was conducted of the 2005/2006 Design Business Association (DBA) Inclusive Design Challenge [5]. 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. Of the six teams taking part, three lay in product design and three in communication design. Information was collected from all six companies but we focused especially on three of them, tracking their processes in more detail.

We observed the teams' process in formal meetings and interactions with users, collecting audio and visual data and making structured observations. These were

augmented with semi-structured interviews, developed based on findings from the literature review and earlier projects. These interviews investigated what happened outside meetings and also examined the companies' general design process.

### **Expert interviews**

To augment this information, interviews were carried out with two expert designers and design facilitators. Expert 1 is a design researcher, specialising in inclusive design, and with many years of experience in facilitating user involvement amongst designers. Expert 2 is a practicing designer with a particular interest in inclusive design. He is a Creative Director with an international product design company.

### **Analysis**

The analysis of these findings was based around a three-tier coding scheme. Items of data were coded according to the particular points of interest that they related to. The first two levels of coding were identified through the literature review and these informed the subsequent studies. As the studies progressed, both levels of codes were refined and further sub-codes were identified and drawn out.

## **3. Findings**

### **3.1 Information Sources Used**

Although designers obtain information from a mix of different sources, our study indicates that the first point of reference is often the client, in particular through the design brief. The literature, our interviews on the DBA Challenge and expert interviews all indicate that designers place a high reliance on this for information, particularly for information about users (e.g. [10,18]). We noted in our interviews with Challenge companies that this may also be accompanied by a reluctance on the part of designers to carry out additional information searches for themselves. Indeed, within design teams, the primary information search is often carried out by account handlers or new business managers rather than designers.

Apart from obtaining information from the client, designers' information search can be fairly opportunistic [17] and use a variety of sources, as shown in Table 1.

### **3.2 Information Formats Used**

The format of a piece of information is closely connected to its source. For example, information coming directly from people is often verbal and books use paper and text. We thus found that designers consult a range of formats, including their own experiences and imaginations, paper and digital documents, product examples, verbal information, and observations and videos of users.

**Table 1.** Commonly used information sources

Source	Details
Client	Communicates information particularly through the design brief.
The Internet	Information is obtained through both specific sites (e.g. news sites and design blogs) and the use of search engines.
Specialist research departments and agencies	E.g. market research companies and reports.
Domain experts	E.g. contacts at the RNIB for information on visual impairment or a manufacturing company for data on particular manufacturing techniques.
Users	There may be some direct contact with users. Different research methods are used, but are not discussed in detail here.
Other people	E.g. members of the design team, friends and family.
Trade literature	E.g. design magazines.
Books and journals	Including books of guidance, materials and measurements, as well as academic publications.
Professional conferences and workshops	These may be more commonly used as sources of knowledge and expertise than for specific pieces of information.
Other projects	Includes information gathered for other projects and the study of the history of related products.
Self	The use of intuition, past experience and the designer's own use of the product.

Much of the designers' information comes from the client. It is therefore useful to examine the formats in which this is provided in more detail. We found that these vary widely, from a simple brief, just saying what was researched and what the client wants done as a consequence, to video footage and quotes from users. Crilly et al [4] explain that the "formal reports that research specialists produce often include... images supported by titles, text and tables that provide additional details". However, one of the experts we interviewed said that these reports are usually quite "word-heavy", for example, charts, tick lists and typed-up descriptions of user sessions, presented in Powerpoint and possibly summarised as a set of keywords.

### 3.3 Difficulties with Information

Clients are often primary sources of information and frequently provide user information, especially in the form of market research data. However, some of the DBA Challenge companies said that they often don't provide enough, especially on how users work. Conversely, our study highlighted the fact that designers can often find themselves faced with too *much* information which they then need to filter. In particular, designers spend little time reading and do it selectively [12]. Expert 1 explained that the cost and time needed to search for information can be prohibitive.

There are also certain characteristics that make a piece of information less likely to be used or well-received. Some characteristics identified primarily by the expert interviews and the literature are shown in Table 2.

**Table 2.** Disliked characteristics of information

<b>Characteristic</b>	<b>Example</b>
Irrelevant	“designers generally don’t gain much relevant insight... from just looking at cold lists of facts and figures as to how many units of this have sold relative to that” (Expert 2)
Dull	“Questionnaires can be a bit sort-of flat and a bit dull” (Expert 2)
Difficult to find	It can be difficult to locate relevant guidelines [9]
Inaccessible	Academic papers are often not used because “It’s all seen as totally indigestible” (Expert 1)
Too authoritarian	Designers react badly to being told they must do things in a certain way: “There is that... resistance to strict guideline cultures.” (Expert 1)
Too academic / abstract	Guidelines are often very abstract and general-purpose and it can be hard to translate them into practice [9]
Doesn’t fit with the standard process	“Brainstorming is actually a very low tech process... So suddenly to have to get out the computer and to have to bring everything up – it’s too much of an [effort]” (Expert 1)
Out-of-date	“the other big factor is that they see academic information as being several years out of date” (Expert 1)

### 3.4 Information that Designers Like

Conversely, the experts and literature also identified several characteristics of information that designers did like, shown in Table 3.

For user data, the literature suggests that raw data is used more productively than more abstracted data, with designers tending to reject abstracted models of user behaviour in favour of richer user stories [13]. As designers also like concise formats, “manageable nuggets” of video footage are suggested as a compromise [14].

The design teams on the DBA Challenge suggested that a mixture of different types of information is needed: there’s no one single most useful kind. One team said “a good mix of statistical hard facts and figures is great but you need a more human qualitative feedback as well”.

## 4. Discussion

### 4.1 Implications for Presentation of User Information

In summary, designers use information from a range of different sources, with the client usually being their first point of reference. In fact, designers often obtain information via clients and account managers rather than searching for it themselves.

**Table 3.** Preferred characteristics of information

Characteristic	Supporting quote
Concise	“Designers tend to prefer the research findings to be presented concisely.” [1] “Typically I would say... images and keywords and succinct things” (Expert 2)
Visual	“visual stuff rather than word-based stuff” (Expert 2)
Tangible	“also having samples or prototypes or real, tangible elements” (Expert 2)
Experiential	“[designers] love the things that help them to have a short experience... Simulatory, like the [simulation spectacles], getting in a wheelchair or having an experience of that disability... very experiential.” (Expert 1)
Stimulating, generating insights	“actually watching through tapes of someone being interviewed or... responding to stimulus material... tends to generate genuine insights rather than just people’s existing perceptions or preconceptions.” (Expert 2)
Open-ended	“something that they feel is open ended, where they have actually made the discovery themselves... something will then act as a trigger for an idea that they feel that they own.” (Expert 1)
Flexible	“The designers wanted a flexible and intuitive resource that allowed access to information in different ways” [16]
Exploratory	“they like websites... because they felt that they could take what they wanted from it and... they’re used to navigating” (Expert 1)
Up-to-date	“whatever is on the web is [seen as] timely... it’s seen as ‘of the moment’, ‘the latest’ ” (Expert 1)
Quick and easy to use	Designers would use a new information format “if it gave them a quicker and easier way of accessing the... information” than existing methods (Expert 1)

It is therefore important to consider the information needs of clients and account managers as well as those of designers. Information needs to be straightforward for clients and account handlers to find and obtain (and identify its applicability to a project), as well as easy for designers to use and apply.

Designers themselves access data in multiple formats, but they tend to prefer those with the characteristics highlighted in Table 3: information that is concise, visual and tangible; generates experience and insights; can be explored in flexible and open-ended ways; and is quick and easy to use. Conversely, they tend to dislike information that is perceived to be irrelevant or dull; is difficult to find, inaccessible, authoritarian, too abstract or out-of-date; or does not fit with their standard design processes (Table 2). These characteristics were identified by the experts we interviewed and by the literature, and can also be observed in the kinds of information sources that were commonly consulted: in addition to paper and digital documents, designers often referred to their own experiences and imaginations, product examples, verbal information, and observations of users.

These characteristics have direct implications for the presentation of user information. To help such information to be more widely used and applied, we should consider providing it in formats that have the characteristics listed in Table 3 and that avoid those in Table 2. In summary, it should be quick and easy to find and use, visual and stimulating, flexible and open-ended, and relate clearly and concretely to design issues.

This reflects what we previously discovered about the nature of the design process and the kinds of design methods commonly used by designers [12]. The design process was found to be variable, often informal and flexible, with diverse activities and stages of design mixed together. We also found that there was a tendency, especially in early stages, to use informal, exploratory, light-weight methods and that visualisation methods were also popular. These characteristics match those suggested for information formats: flexible, open-ended, visual, quick and easy to use.

As a consequence and as the examples in Table 2 show, unsuitable formats include lists of facts and figures (such as questionnaire results), academic papers and abstract guidelines. Also inappropriate is information that does not fit with the relevant parts of the standard design process, such as computerised information that aims to help the predominantly low-tech brainstorming process. Suitable formats, on the other hand, include the examples mentioned in Table 3: concise descriptions of findings, backed up with images; videos of users; simulation kits that help designers to empathise with disability first-hand; and hyperlinked electronic systems (such as the Internet).

#### 4.2 Categorisation of Information Presentation

In order to assess the current situation and suggest improvements to information formats, it is helpful to create a categorisation of the kinds of design and user information that are currently available. To do this, we first compiled a list of different kinds of information. We drew from the list in Table 1 and augmented it with other information mentioned by designers and with other kinds of user information that we were aware of.

**Table 4.** Categorisations of design information

Categorising by format		Categorising by information type	
Paper	Data tables	Background	Culture
	Books		Personal experience
Academic publications	Design press	Stories	Prior knowledge
	General press		User stories – personas, biography, fiction
Reports and leaflets			Anecdotes
			User observations
Mixed media	Film, video and TV	Data	Design case studies
	Internet		Data tables
Software and interactive media	Lectures and talks		Academic output
	Courses and interactive sessions		Design data
Physical kits			Ad-hoc information
			User testing
People	Talking directly to someone, specifically to obtain the relevant information	Guidance	Patterns
	Observation		Design Guidance
General absorption from the culture			Lectures/courses
	Personal experience		Advice (e.g. from experts)
		Simulators	Physical, software, engineering

This list was then categorised in various ways. Two categorisations were found to be particularly helpful: categorisation by format and by type, as shown in Table 4. These factors are independent so that each information format can be used to convey

information of various types and each information type can be presented using more than one format. For example, talking to people (e.g. experts, users or other designers) can provide background information, stories, specific data and design guidance.

These categorisations outline the main areas of information presentation, but we recognise that they may not be complete. Further formats can be added within this framework.

### **4.3 Discussion of Some Specific Types of User Information**

There is not enough room in this paper to go into all of these information formats and types in detail. Instead we examine some particular examples of ways of conveying user information that are of particular relevance to inclusive design. We briefly examine their characteristics in the light of the suggestions in Section 4.1 above and suggest how they might be improved, giving examples from our own work. Some discussion on these formats in the light of preliminary findings on information use was previously published in [8].

#### **Capability Data**

A particularly important type of user information for inclusive design is detailed data on users' capabilities and how they vary across the population. Such information provides a detailed understanding of disability and how it impacts product use. It also supports designers in making detailed decisions, enabling them to consider, for example, how many people would be excluded by certain design features.

However, this information is often presented using methods such as tables of figures and graphs (e.g. [19]). While these formats are concise, a characteristic that designers like, they do not fit designers' preferences for being visual and flexible and they do not tend to simulate creative insights. Similarly, the data is concrete but it can be difficult to translate it into design terms. It can therefore sometimes seem rather dry and abstract and may not encourage empathy with users.

We are exploring alternative, promising methods of presentation, which apply the data more concretely to design by using examples to illustrate the effects of capability restrictions on daily life and on product use. Photographs and diagrams can be used to do this in a visual and engaging manner, and flexible, exploratory formats such as card packs or websites can be adopted to enable more open-ended use of the data.

#### **Personas**

Personas are fictional users, often based on real people, who represent the end users during the design process [3]. They can be presented in many different ways, from textual descriptions through photographic montages to video snippets, and help to focus the designers' attention on the needs of the end users. If sufficiently detailed, they can help to create empathy with the end users and provide in-depth insight into their needs and lives.

Personas can be used informally and flexibly and they allow and encourage the exploration of user needs, all characteristics that designers like. Different methods of presentation mean that they can be adapted to different situations of use, with visual

methods showing particular promise for engaging designers. They can also be used cheaply and quickly. However, really reliable and representative personas can take a long time to create, especially if they are tailored for a particular project. In addition, personas are not well suited to presenting detailed technical information, e.g., about disability, and their focus on representative individuals can make it hard for them to communicate the range of abilities in a population.

We are developing personas that present some of the main issues in inclusive design and that can be used directly by the designers without them having to engage in an extensive research period. Sets of personas, built and described as social groups, help to communicate a range of abilities and discourage designers from thinking just of individuals in isolation. Video clips of real users help to emphasize the reality of the situations behind the fictional accounts.

### **Simulators**

Another way of communicating about capability loss is by simulating its functional effects in the designer. For example, spectacles can simulate various kinds of vision loss and arm and hands restraints can restrict movement, simulating some of the effects of arthritis.

These simulators can help a designer to sympathise with disabled users and to gain an internalised understanding of capability loss. They fit with designers' preferred characteristics by being tangible, stimulating and engage the designer in experiencing the user's situation first-hand. However, it can also be difficult to translate the information from simulators into design terms. There are also limits on what can be simulated, e.g. suitable and realistic methods of simulating cognitive impairments have yet to be found. Simulators can also only communicate certain aspects of what it is like to have a disability, failing, for example, to account for context, support and coping strategies.

We are therefore developing graded simulators that allow the examination of individual capabilities separately [2], thus allowing more flexible use. This also enables designers to identify the particular capability losses that cause difficulty, thus helping them to translate their experiences into concrete design actions. For example, if vision loss causes particular difficulty in distinguishing colours on the screen of a mobile phone, the designer will know to work on that particular aspect.

## **6. Conclusions and Future Work**

This study of design practice discovered various commonalities in designers' preferences for design information. The evidence from the literature, observations of a design competition, and interviews with designers and experts converge to indicate that designers prefer information that is quick and easy to find and use, visual and stimulating, flexible and open-ended, and relates clearly and concretely to design issues.

Some specific examples of types of user information have been described. Their suitability in terms of the above characteristics has been discussed and suggestions given for how they can be improved, based on our current work. We plan to continue

to develop these types of user information and other methods for supporting designers in carrying out inclusive design, based on our findings about the design process.

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