

Usability and accessibility: best friends or worst enemies?

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Abstract:

This paper discusses the relationship between usability and accessibility in web design which is thought by some to involve contradictory design requirements. It examines the relationship between the two design fields by comparing and contrasting definitions of each along with the techniques and methods used by their practitioners. It considers two commonly-expressed views of the relationship, concluding that both are misleading. The paper defends the view that usability and accessibility are complementary design philosophies and recommends that practitioners in each field embrace the methods and techniques of the other.

1. Introduction

Increasingly, the relationship between usability and accessibility in web design is being discussed; at conferences, on mailing lists and websites, and in meetings and discussions between those who work in these fields. Despite a growing interest in the issue, much of the discussion has suffered from a distinct lack of clarity and depth. This leaves our understanding of the relationship unclear, and practitioners and advocates of either approach unsure about how this could or should impact on their work.

To date, it seems that many view the relationship to be adversarial. In an online survey conducted by the British HCI Group, 56% of the 117 respondents said they thought there was a conflict between usability and accessibility (Knight 2003). In the online publication, *Digital Web Magazine*, Koch (2002) writes:

The delicate balance between accessibility and usability needs more thought. At the moment I don't see any answers, only a few questions, one possible rule, and a potential danger. The rule is "Accessibility should not restrict usability".

Is this attitude well-founded? Are usability and accessibility on an inevitable collision course? Are they worst enemies, or could they be best friends?

The primary concern of this paper is to consider the relationship between usability and accessibility. A key goal is to clarify some of the ambiguities that I suspect have clouded discussion to date. Before we can draw any conclusions about the ways in which usability and accessibility may be related or impact on each other, we need to be clear about what each discipline is and what each set of practitioners do. To that end, the paper will begin by considering and comparing definitions of each design approach along with the methods and techniques that are routinely employed by those working in these fields.

2. Definitions

No single authoritative definition exists for either usability or accessibility, so we will consider a range of definitions: from leading exponents in each field, those offered by practitioners, and more formal definitions as documented in the standards for usability and accessibility.

2.1 Usability defined

Jakob Nielsen is a leading advocate for web usability and he defines usability as "a quality attribute that assesses how easy user interfaces are to use. The word 'usability' also refers to methods for improving ease-of-use during the design process." (Nielsen 2003).

Practitioner Whitney Quesenbery says "the 5 Es of usability" provide a more robust definition. The 5 Es include effectiveness, efficiency, engaging, error tolerant and easy to learn (Quesenbery 2002).

A more formal definition from the Organisation for Standardisation can be found in the widely cited ISO 9421: "Usability is a measure of the effectiveness, efficiency and satisfaction with which specified users can achieve specified goals in a particular environment."

2.2 Accessibility defined

Tim Berners-Lee, the inventor of the web and Director of the World Wide Web Consortium defines accessibility in terms of disability and universality: "The power of the web is in its universality. Access by everyone regardless of disability is an essential aspect." (W3C 2005)

Jim Thatcher (2004), a practitioner in the field writes, "Basically, technology is accessible if it can be used as effectively by people with disabilities as by those without."

In its Web Content Accessibility Guidelines (WCAG), the W3C does not formally define accessibility, but instead offers the following:

These guidelines explain how to make Web content accessible to people with disabilities... The primary goal of these guidelines is to promote accessibility. However, following them will also make Web content more available to all users, whatever user agent they are using (e.g., desktop browser, voice browser, mobile phone, automobile-based personal computer, etc.) or constraints they may be operating under (e.g., noisy surroundings, under- or over-illuminated rooms, in a hands-free environment, etc.). (Chisholm, et al. 1999)

2.3 A comparison based on definitions

There are two key differences between usability and accessibility that can be drawn from these definitions. The first relates to the goal of design. The goal of usability is a better experience for the user; better in terms of efficiency, effectiveness, and satisfaction. In contrast, the goal of accessible design is the removal of barriers to access based on disability, technical or environmental limitations. However, there is some similarity. Not being able to access a website is a poor experience—very poor—and accessible design seeks to address this.

The second difference concerns the target audience for the design. Definitions of usability do not specify in advance who the end users are. It depends on the website or application being designed, and so will be different for different projects. In the case of accessibility, the users are always the same. They are primarily people with disabilities, while other users of the web are mentioned as secondary beneficiaries. This suggests a significant difference in the underlying design philosophy. From the usability perspective, the user experience is enhanced through identifying and understanding the target users of a site and designing with their particular needs in mind. Conversely, the underlying theme in web accessibility is the notion of universal design and the fundamental premise is that the use of accessibility standards will improve the lot of all users. Many usability professionals would dispute the notion that it is possible to achieve these sorts of design outcomes: as reported in the British HCI survey, 49% of respondents were of the view that that it is impossible to cater for all users' needs (Knight 2003).

There is an apparent tension between an approach that insists "one size does not fit all" and another that seems to imply the opposite. Can this tension between universals and particulars be resolved or does it lead to inevitable conflict?

I think the tension can be resolved, and we need look no further than the work on design heuristics, initiated by Jakob Nielsen and Rolf Molich in 1990 (Nielsen & Molich 1990, Nielsen 1994, Bailey 1999). Heuristics are broad guidelines or principles that are said to result in improved usability. There is nothing in the literature on heuristics that indicates they

do not apply universally. Moreover, usability heuristics look remarkably similar to universal design principles, as the examples below demonstrate.

First, let us look at Nielsen's usability heuristics (Nielsen 1994):

“Visibility of system status

The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

Match between system and the real world

The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

User control and freedom

Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

Consistency and standards

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

Error prevention

Even better than good error messages is a careful design which prevents a problem from occurring in the first place.

Recognition rather than recall

Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

Flexibility and efficiency of use

Accelerators—unseen by the novice user—may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

Aesthetic and minimalist design

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

Help users recognize, diagnose, and recover from errors

Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

Help and documentation

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.”

Now consider these principles of universal design from the Center for Universal Design (Connell et al. 1997):

“Equitable use

The design is useful and marketable to people with diverse abilities.

Flexibility in use

The design accommodates a wide range of individual preferences and abilities.

Simple and intuitive use

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

Perceptible information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Tolerance for error

The design minimizes hazards and the adverse consequences of accidental or unintended actions.

Low physical effort

The design can be used efficiently and comfortably and with a minimum of fatigue.

Size and space for approach and use

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.”

As we can see, both sets of principles are similar in breadth. They are even similar in substance—flexibility, simplicity, error tolerance and effort minimisation are common themes—despite the fact that Nielsen's heuristics apply to the specific design domain of software user interfaces. So it appears that the notion of universality is not foreign to usability after all.

Just as usability includes some appeal to universality, accessibility acknowledges difference. Accessibility is not about "one size fits all" in a narrow sense, but about flexible and inclusive design. A good example of this can be found in the IMS AccessForAll specifications (IMS Global Learning Consortium 2004). Two specifications comprise the AccessForAll initiative:

“IMS AccessForAll Meta-data Specification

The AccessForAll Meta-data specification is intended to make it possible to identify resources that match a user's stated preferences or needs. These preferences or needs would be declared using the IMS Learner Information Package Accessibility for LIP specification. The needs and preferences addressed include the need or preference for alternative presentations of resources, alternative methods of controlling resources, alternative equivalents to the resources themselves and enhancements or supports required by the user. The specification provides a common language for identifying and describing the primary or default resource and equivalent alternatives for that resource.

IMS Learner Information Package Accessibility for LIP

The Accessibility for LIP defines two sub-schemas for the IMS Learning Information Package that define a means to specify accessibility preferences and learner accommodations. These preferences go beyond support for disabled people to include kinds of accessibility needs such as mobile computing, noisy environments, etc.”

An example of this kind of approach in action can be seen in the Web4All project in Canada (Treviranus 2002). In this project, smart card technology was developed to allow people to select, save, and then use their own desktop computer preferences when using public access Internet facilities such as those provided in libraries. The goal was to allow Canadian citizens to access the Internet in a manner that meets their needs.

Our discussion thus far shows that we need not be overly concerned about the appearance of a fundamental difference in design philosophy. Digging deeper reveals that accessibility and

usability share universal and particularist approaches to design. Where they differ is in which of these is given greater emphasis.

3. Methodology and practice

Let's move on now to consider the methodology and practice of each discipline. Again our goal will be to look for similarities and differences to aid our understanding of the relationship between usability and accessibility.

3.1 Usability practice

Usability practitioners employ a wide range of techniques in designing for improved usability. These methods are employed at various stages of the development lifecycle using a methodology known as "user-centred design" or UCD. Some of the techniques used include:

Competitor research

A competitor analysis is usually conducted very early in the research phase of a design project and may involve user testing and/or a review of competitors' websites or applications. It typically identifies the strengths and weaknesses of competitors' offerings. (See Usability Net 2003, Kuniavsky 2003)

Web server log analysis

Broad usage patterns can be identified by analysing web server logs. Server log data can also assist in identifying the location of users and the type of browsers and operating systems they are using. (See Tech-Ed Inc. 1999)

Search log analysis

Search logs contain data about how users search, what search terms and syntax they use, which searches have been successful and which have not. They can also provide an insight into users' language. (See Robertson 2004, Belam 2003)

Surveys

Online or paper-based surveys can provide access to large groups of users and assist with identifying user requirements. Surveys can also be used for subjective evaluation of usability. (See Kuniavsky 2003)

Interviewing

Structured interviews provide a method for researching user requirements, tasks and goals. (See Kuniavsky 2003)

Focus groups

Focus groups, a methodology used largely in market research, can also be used to help identify user requirements. (See Kuniavsky 2003)

Contextual inquiry or field studies

A research method based on structured interviews and observations that take place in the users' workplace or the location in which the system will be used. This method is used primarily to gain an understanding of users' tasks or work, work culture and physical environment. (See Beyer & Holzblatt 1998)

Task analysis

This is a collection of techniques used to gain an understanding of users' tasks to assist in the design of an appropriate user interface. (See Hackos & Redish 1998)

Design guidelines or standards

Sets of guidelines or standards (such as those defined in a style guide) are sometimes used to guide the design of a user interface.

Card sorting

A technique used in the design of an information architecture for a website that aims to provide an understanding of how users categorise content. Users are asked to sort a set of cards, each with information about a topic area, into groups of related items. (See Maurer & Warfel 2004)

Prototyping

Prototyping involves modelling design ideas (often on paper) and testing them with users. Changes can be made quickly and cheaply and further testing then takes place resulting in further refinements to the design. (See Snyder 2003)

Walkthroughs

A method for evaluating a design by having a group of designers, usability professionals and users walk through a task scenario, discussing and evaluating each page or screen or interaction element. (See Bias 1994)

User testing

Using task scenarios and users who are representative of the target audience, user testing is a method used to evaluate the usability of a user interface. (See Rubin 1994, Dumas & Redish 1999)

Heuristic evaluation

An expert evaluates a user interface against a set of design heuristics or broad design guidelines. (See Nielsen & Molich 1990)

3.2 Accessibility practice

In contrast, accessibility practitioners use a much smaller set of techniques:

Design guidelines or standards

The W3C has developed a set of international standards for web user interfaces, the Web Content Accessibility Guidelines 1.0 (version 2 is in development). These standards consist of 14 broad guidelines and 65 design checkpoints. The Section 508 guidelines used widely in the United States were derived from the W3C guidelines. (See Caldwell et al. 2004, Chisholm et al. 1999, Treviranus et al. 2000, Jacobs et al. 2002, Section 508 2002)

Conformance evaluation

The W3C has published a method for testing website and applications to determine their conformance with WCAG (Brewer & Letourneau 2002). The method includes manual and automated inspection techniques, and user testing. Alternative, though similar, methods have also been published (see Arch et al. 2003, Smith & Bohman 2004).

3.3 A comparison based on methodology and practice

The most obvious differences between usability and accessibility are the number and variety of methods routinely used by usability practitioners. However, any of the usability techniques mentioned above could also be applied to design for disabled users, and in some cases this is starting to occur.

Accessible design methods have equivalents in usability practice. The use of design guidelines is common to both, and the manual inspection methods used in conformance evaluation can be compared with standards inspection in user interface design.

Both design practices also share user testing as an evaluation technique. However user testing for accessibility is often focused on testing for conformance with accessible design standards and as a result, the methodologies can be very different. For instance, usability testing is task-

based, but a significant proportion of user testing for accessibility involves page checks—evaluation of individual pages against the design standard. And it is not uncommon for only expert users of technology to be engaged in user testing for accessibility. In usability testing, users are representative of the target audience, and if that includes novice users of technology, then novice users are included in testing. A further difference is the tendency to use the same users in accessibility testing, possibly because of the use of expert users of assistive technology for conformance evaluation, but also because it can be very difficult to recruit disabled testers. In usability testing, it would be unusual to use the same participants over and over, even when testing the same system.

While there are similarities in the techniques used in each field, there are some significant differences. In the accessibility field it is uncommon for user research to take place in the early stages of a design project. Yet there is widespread recognition that retrofitting a design to make it more accessible is highly problematic. It is not only costly, but is also a less effective means of ensuring accessibility than designing with accessibility in mind from the start. However, unless accessible design becomes a consideration in the requirements phase of a project, and research is done to identify disabled audience groups and understand their needs, the risk of having to retrofit increases.

Currently, accessible design relies heavily on the use of design guidelines. This can happen in the usability community too, but generally usability practitioners use a range of design techniques as part of a user-centred design process. The reliance on design guidelines is a highly controversial topic in the usability community. There are several reasons for this:

- There are many different and sometimes conflicting sets of usability guidelines (Spool 2002). Which ones should be followed?
- Sometimes guidelines are written in very broad language and are subject to interpretation errors and misapplication (Spool 2002, Rouborn 2004).
- Some design guidelines are not based on user research.
- The most worrying criticism is that in using design guidelines we are acting on an assumption that this will result in better design, but perhaps it will not (Spool 2002).

Similar concerns have been raised about design guidelines for accessibility (Sloan et al. 2000, Light 2002, Clark 2003). The most recent discussion, which focused on the adequacy of the WCAG guidelines, arose from a study on the accessibility of British websites commissioned by the United Kingdom's Disability Rights Commission and conducted by the Centre for Human Computer Interaction Design at City University (Disability Rights Commission 2004, Brewer 2004, Hudson 2004). The study concluded that:

... many of the problems encountered by users are of a nature that designers alone cannot be expected to recognise and remedy. These problems can only be resolved by including disabled users directly in the design and evaluation of websites. (Disability Rights Commission 2004, p. 33)

And this most recent criticism points to a lack of user involvement in accessible design. Currently, the only technique that has a user focus is the use of user testing in conformance evaluation. This deficiency has been recognised by some in the accessibility community. An excellent online resource on user-centred design methods for accessibility has recently been produced by the Information Technology Technical Assistance and Training Center in the Georgia Institute of Technology in the United States (2004). There are three main chapters:

- Accessibility in the analysis phase shows how to incorporate accessibility early in the design process. The user analysis section focuses on including people with disabilities when developing user group profiles, personas, and scenarios.
- Accessibility in the design phase introduces approaches for considering accessibility issues during design and includes accessibility standards, guidelines, and techniques.
- Evaluating for accessibility provides guidance on including accessibility in common evaluation techniques including heuristic evaluation, design walkthroughs, and usability testing.

There are also deficiencies in the approaches taken by usability practitioners when it comes to accessibility. On most projects, people with disabilities are invisible. They are not seen as a target audience group and their needs are consequently overlooked. Alternatively, people with disabilities are seen as a small and insignificant group, and therefore accessibility is seen as something for which there is no market and therefore no business benefit.

But there is a market for accessible design, and it is bigger than most realise. Research commissioned by Microsoft and conducted by Forrester Research in 2003 shows that "the majority of working-age adults are likely to benefit from the use of accessible technology" (Forrester Research 2003, p. 8). The research highlighted the fact that the average age of computer users is growing and that ageing increases the need for accessible technology as existing impairments become more severe, and people develop new impairments. The report concluded:

In the United States, 60% (101.4 million) of working-age adults who range from 18 to 64 years old are likely or very likely to benefit from the use of accessible technology... Among current US computer users who range from 18 to 64 years old, 57% (74.2 million) are likely or very likely to benefit from the use of assistive technology (Forrester Research 2003, p. 16).

While these figures relate to the population in the United States, the Australian Bureau of Statistics (2004) reports that "in 2003, close to a third (32%) of people participating in the labour force were aged 45-64 years, up from 24% in 1983". There is nothing to suggest that the needs of an ageing Australian workforce are radically different to their American counterparts. The assumption that there is no market for accessible web design is therefore incorrect.

Accessible design is considered to be an optional extra. However, this view is also mistaken. Legislation in many countries, including Australia, prohibits discrimination based on disability (Henry 2004) and websites that are not accessible expose their owners to the possibility of litigation. Many business people are unaware of the Australian legal case, *Maguire v SOCOG*. Bruce Maguire, who is blind, brought a case against the Sydney Organising Committee for the Olympic Games on the grounds that he was unable to access certain information on their website (Clark 2004). SOCOG were found to have discriminated against Maguire and ordered to repair their site. When they did not do this, claiming the costs were prohibitive, they were ordered to pay him \$20,000 in compensation.

Finally, there are a range of business benefits that derive from accessible design. The main benefits are increased market reach through the adoption of universal design, improved efficiency through the use of web standards, and the demonstration of social responsibility (Arch & Letourneau 2002).

Usability practitioners are starting to advocate for the inclusion of users with disabilities in design research and evaluation (Henry 2002, Hudson 2004, Olsen 2004), but there is a long way to go before the needs of disabled users are mainstreamed into usability practice.

4. Common expressions of the relationship

There are two common expressions of the relationship between usability and accessibility. In this section of the paper, we will consider whether either of these is useful.

4.1 Accessibility is a subset of usability

Many express the relationship between accessibility and usability in terms of the former being a subset of the latter:

Accessibility can be approached as a subset of usability (Henry 2002).

I'm worried about false dichotomy between usability and accessibility. One is a subset of the other (W3C 2000).

Accessibility is a subset of usability. Accessibility means designing a user interface that is not only effective, efficient and achieving user satisfaction, but also inclusive of more people in more situations. Usability nowadays often assumes accessibility (Hoi-Yan Ma & Zaphiris 2003).

The problem with this view of the relationship is that some may conclude that usability practitioners include accessibility concerns as part and parcel of their design practice. In fact, they may not. Many usability practitioners are not even aware of design techniques aimed at maximising accessibility nor do they include disabled users in design research and evaluation. So from a practical point of view, accessibility is not a subset of usability. Additionally, accessible design guidelines include technical considerations. For instance, WCAG specifies that documents must be created to “validate against formal grammars” (Chisholm et al. 1999). These kinds of concerns are rarely the domain of the usability expert.

4.2 Accessibility is a necessary but not sufficient condition for usability

The second view of the relationship between accessibility and usability is that accessibility is a necessary but not sufficient condition for usability:

We have become accustomed to thinking of accessibility as an isolated issue, when of course it is simply a prerequisite to usability (Hudson 2004).

Obviously, technical accessibility is a pre-condition for usability: if users cannot get at the content of the web pages, they also cannot use the website. Technical accessibility is necessary, but not sufficient for usability of a design. Even if a site is theoretically accessible because it follows the technical accessibility standards to the letter, it can still be very hard to use for people with disabilities (Nielsen Norman Group 2001).

It is not uncommon for people to think of accessibility guidelines as technical guidelines, and that is one of the reasons for the popularity of this second view (Hanson 2004, pp. 1-2; Richards & Hanson 2004, p. 72.). However accessible design guidelines include non-technical requirements. For example the requirement to “use navigation mechanisms in a consistent manner”, a WCAG recommendation, is akin to a usability design requirement

rather than a technical one (Chisholm et al. 1999). Therefore this expression of the relationship is also misleading.

5. Best friends or worst enemies?

Based on the discussion above, usability and accessibility appear to be compatible design approaches. They share a concern for universal design as a foundation for good design and recognise the need for design to accommodate specific user needs. They also share some design methods and techniques. As a result, some believe that accessibility improves usability and/or that accessibility can improve usability. On the other hand, there are those who argue that the two approaches suggest incompatible design requirements. So are they best friends or worst enemies?

It is true that design guidelines may sometimes suggest contradictory design solutions, but this is equally true of different sets of usability guidelines as it is of accessibility and usability guidelines. Focusing on the potential for conflict is the result of inflexible thinking and lack of design experience or expertise. Design is not about rigid adherence to a set of guidelines or the superiority of one set over another. Design guidelines are not the Holy Grail. As Jeffrey Zeldman recently said:

Accessibility is not the memorisation of a set of rules, but, like other aspects of design and usability, it's something to think about. It's something filled with challenges. It's something that intelligent and reasonable people can disagree about. There's more than one right way to do something (Zeldman 2004).

Some of the guidelines specified in WCAG can lead to improved usability. For example:

- Checkpoint 13.3 advises designers to include a site map or table of contents to provide information about a website's structure. In usability testing, I have observed people using site maps to find content that they would otherwise have been unable to locate. Site maps benefit a wide range of users, regardless of whether or not they have a disability.
- Checkpoint 13.1 recommends that the target of a linked resource be clearly identified, rather than using link text such as "click here". This guideline is aimed at assisting visually impaired users who, when using a screen reader, may hear links read out of context of the surrounding page text. But it benefits a much wider group. We know that most web users generally scan web content and because links tend to stand out from other text on a page, using meaningful link text makes it easier for everyone to know which resources are linked from the current page.

Similarly, designing for improved usability can also improve accessibility. For instance, writing concise plain English text and designing simple and understandable navigation—common design prescriptions from a usability perspective—will enhance the experience for a broad range of users, including those with disabilities.

6. Conclusion

Usability and accessibility are not worst enemies. They could, and should, be best friends.

Usability and accessibility have different though not incompatible design philosophies and goals. They use different but compatible methods. Their practitioners share concerns for improving the user experience, though they may have different sets of users in mind.

Focusing on the possibility of conflicts between design guidelines for accessibility and usability is a red herring. The real challenge in user interface design is not deciding which set of guidelines should trump the other, but in understanding the requirements of various user groups and finding a way to design a user interface that meets their needs.

Practitioners in both fields can and should collaborate. Each has knowledge and skills that will benefit the work of the other.

Accessibility practitioners should embrace the practices of their usability counterparts by:

- Ensuring that the requirements for accessible design are made explicit in the requirements phase of projects by identifying users with disabilities as part of the target audience for the design
- Engaging in design research in addition to knowing how to apply accessible design guidelines
- Adopting and advocating user-centred methods in all phases of their design projects.

Usability practitioners should embrace the practices of their accessibility counterparts by:

- Making clients aware of the growing market for accessible design
- Educating clients about the business benefits of accessible design
- Discharging their professional responsibility to advise clients of relevant legislation, in this case the requirements of anti-discrimination legislation
- Making disabled users visible by including them in their design practices.

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