Accessibility and usability: web technologies essay

Abstract:

The relationship between accessibility and usability can be a contentious issue especially with the advent of new web technologies. Does accessibility have an adverse effect on usability and vice versa and is this in anyway affected by new web technologies? With the advent of new web technologies it is thought by some that the two supposedly bipolar methodologies of web design and evaluation contradict one another even more. In order to determine if this is in fact true this paper will look at the effect of new web technologies on accessibility and usability and the current practices in each of these areas. This paper considers various views on this topic, compares definitions and methodologies and concludes that even when using new web technologies, embracing both sets of practices and recognizing their points of similarity, it is still possible, with considered and judicious use of new web technologies to make a web design that is both usable and accessible.

1. Introduction

Some accessibility practitioners believe that by applying new web technologies to a web design, that because of the added level of complexity, they create another barrier to disabled people (Everett 2006).

Some usability practitioners believe that by enforcing accessibility practices that the interactivity will in some way suffer (Koch 2002). In terms of new web technologies is this still the case.

Is there any merit in these beliefs? Can common ground be found to achieve the some kind of balance?

There appears to be a lack of clarity of what constitutes a usable web site and misunderstanding of what constitutes a truly accessible website.

The aim of this paper is to discuss the relationship between usability and accessibility by firstly looking at the differences between them and where they overlap. We will then need to understand current thinking on the relationship between accessibility and usability and how it is affected by current web technologies. Will Web Standards and new web technologies have an effect on accessibility and usability? With the advent of Web standards (Featherstone et al. The Web Standards Project 1998) and updated web accessibility guidelines (Henry et al. W3C 2008) it has become easier for developers to create sites that are more usable and accessible. This paper will also investigate technologies such as AJAX (Asynchronous JavaScript and XML)(Garrett 2005), and whether this will have any further effect on the relationship between accessibility and usability

2. Definitions and methodologies2. 1 New web technologies (Web 2. 0)

The concept of " Web2. 0" began with a conference brainstorming session. Members noted that far from being unviable after 2001, when many online businesses collapsed, the web was more important than ever, with exciting new applications and sites appearing regularly (O'Reilly 2002).

Web 2. 0 websites are characterized by their rich and interactive content. This is in stark contrast to the static HTML. By using scripting technologies such as JavaScript an AJAX (Garrett 2005) it is now possible to create web-based applications that resemble desktop applications with the advantage of being able to access them from almost anywhere. Through the use of

scripting libraries it is now possible to add interactive desktop-like interface items to web pages and provide the ability to allow users to make changes to current content.

Core characteristics of Web 2. 0 web sites are (O'Reilly 2002):

Web Services, not packaged software (Web applications)User control over data sources that become more comprehensive the more people use them (Wikis)Users trusted as co-developers (Wikis, blogs)Harnessing collective intelligenceSoftware available to almost any device (Mobile Apps)Lightweight user interfaces and development models

With all of these new technologies and coding techniques, what effect do they have on the relationship between accessibility and usability? Web 2. 0 has the potential to enhance usability due to the added ability to create a more rich and interactive environment for the website user. However with all of these new technologies, can they be interpreted by assistive technologies used by disabled users? Have disabled users been considered? Will methodologies such as design and evaluation need to change?

2. 2 Accessibility

The web gives people with disabilities the ability to do things that they would be unable to do via any other avenue. The web offers them freedom and independence. However, all of these possibilities are removed if a web site is not created in an accessible way.

Essentially accessibility can be defined as access for everyone no matter what disability they suffer from (Berners-Lee, via Henry W3C 2009).

Other have a more flexible approach such as Clark (2002) where he suggests that allowances of for disabled users should be made to make a website accessible.

Another term used in connection with Accessibility is Universal Design, which incorporates elements of usability with the goal of making websites or any product as usable as possible by as many people as possible without requiring adapted or specialized design. (Mace 2008)

The guidelines by which most accessibility practitioners develop and evaluate websites is Web Content Accessibility Guidelines (WCAG) 2. 0 which are updated standards developed by The World Wide Web Consortium (W3C). These are written to accommodate new technologies and provide better and more comprehensive help for developers and designers when trying to make websites accessible. These standards consist of 12 guidelines that are organized under 4 principles: perceivable, operable, understandable, and robust. For each guideline, there are testable success criteria, which are at three levels of priority: A, AA, and AAA with all A guidelines having the highest priority (Caldwell et al. W3C 2008).

The four principles of the WCAG 2. 0 guidelines can be explained as follows (Caldwell et al. W3C 2008):

Perceivable– Web content should be made available to any or all of the senses – sight, hearing, and/or touchOperable– Interface objects such as forms, controls, and navigation must be operable independent of the input methodUnderstandable– The site’s content, information and interface must be understandable to the target audienceRobust– Sites can be used reliably

by a wide variety of user agents such as web browsers, mobile devices and assistive technologies

The W3C also lists various methods for evaluating websites for accessibility to determine their compliance with WCAG (Abou-Zahra et al. W3C WAI 2008). Various methods including preliminary reviews, manual and automated evaluation tools, are used to determine compliance.

When developing websites whether with new technologies or not it is recommended that Web Standards coding practices should be used to attain conformance with WCAG 2. 0.

Web standards are technologies and practices established by the World Wide Web Consortium (W3C), along with other groups and standards bodies for creating and interpreting web-based content. By making use of these technologies it is possible to create web content that benefit a greater number of users and at the same time making this content usable in the long-term regardless of technology changes (Featherstone et al. WASP 2006).

The Web Accessibility Initiative (WAI) of the World Wide Web Consortium (W3C) has developed an Accessible Rich Internet Applications Suite (ARIA) in order to make rich internet content more accessible for people with disabilities (Henry et al. W3C 2009).

This suite is currently not fully supported in all user agents (browsers) and AJAX libraries (Henry et al. W3C 2009).

Will updated accessibility practices be able to enhance or be incorporated into usability practices?

2. 3 Usability

The generally accepted definition for usability in ISO 9241 states: “ the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use”

Usability is defined by five quality components (Nielsen 2003):

Learnability: Ease with which a basic task can be completed at the first attempt. Efficiency: The speed with which a task is performedMemorability: The ease with which an interface will be remembered. Errors: The number and severity of errorsSatisfaction: The level of enjoyment or pleasure when using an interface

An extension of usability is the term User-Centered Design (UCD) (Preece et al. 2006), where users are involved throughout the lifecycle of website developments by using structured methodologies in order to determine and meet all the needs of the target user (Usability. gov 2009).

Some of the techniques used include (Usability. gov 2009):

Usability testing– Representative users are observed while attempting to complete set tasks. Notes on the observations of user behavior and comments are made. Card sorting– Participants arrange and even label cards representing site content into logical groups and categories to inform the

information architecture of a site design. Individual interviews– Individual participants are interviewed typically for 30 minutes to an hour either in person, by telephone, or by any means available which allows conversation. These interviews can be formal or informal and do not involve observation. Contextual interview or field studies– Contextual interviews are similar to user testing because the users are observed, however they are not given a set of task but are rather observed in there natural environment. Observers also take notes. Surveys– These are used to obtain data from large groups of people in a relatively short time and are normally used to gather user requirements. They can also be used for summative usability evaluation. Focus groups– These are usually a discussion among eight to twelve current users or potential users or stakeholders of your site conducted by an experienced moderator. Focus groups typically lasts approximately two hours and covers a range of topics that are decided on beforehand. Task analysis– Is used to determine the typical tasks that users perform to achieve a particular goal. Work patterns are studied and broken down to provide a list of tasks and the order in which they are performed. Prototypes– Are representations of your website/application shown to users in order to inform the design and determine any major defects before proceeding with further development. These can range from paper drawings (low-fidelity) to near complete products (high-fidelity). Expert evaluations– Experts are asked to evaluate sites for usability employing various methods such as heuristic evaluation where sites are evaluated against a set of usability principles. Other methods such as Cognitive walkthroughs and pluralistic evaluation are used (Preece et al. 2006).

Will usability practices need to include accessibility practices in order to include people with disabilities or will doing this minimize usability of web products?

3. Relationship3. 1 Would disabled users also benefit if usability practitioners considered accessibility guidelines as part of the efficiency and satisfaction of a site?

By analyzing the definitions for accessibility and usability to understand their relationship to one another we can see that accessibility focuses on the making allowances to improve the experience for a particular group of users whereas usability focuses on the effectiveness, satisfaction and efficiency in achieving a specified goal of a particular user when using a website. We can see here that the goals are similar albeit with a slight difference in focus. Disabled users can be considered a group of users with varying needs however; in many cases they are not considered when websites are being built (Disability Rights Commission 2004). If a site is not accessible to a user it will obviously not be an enjoyable or effective experience (Clark 2002).

With usability the target audience is determined by means of usability techniques such as questionnaires, surveys and focus groups (Preece et al. 2006). However in many cases accessibility practitioners do not attempt to determine the level of use by a particular disability group for a specified website (Chandrashekar et al. 2006). Some work has been done in this area, however the uptake has not been as expected (Sloan 2006). In addition when websites are developed the focus of the accessibility effort is placed on the needs of blind users without bearing in mind the needs of other user

groups such as those with colour-blindness or low vision. This is mainly due to a lack of awareness of what disability groups exist, besides blind users, and the varying difficulties encountered by these people. The WCAG 2. 0 guidelines attempt to cover these areas but without being able to see these users encounter problems there is little impact and therefore less motivation to cater for these users.

From this we can deduce that disabled users should be included as a potential target group and this should be determined by incorporating usability techniques into web accessibility practices.

3. 2 Should both sets of guidelines and principles be adopted by both sets of practitioners or should a single “ Universal” set of guidelines be used?

If we compare the most commonly used guidelines of both parties we can see that there are similarities. Usability practitioners commonly make use of Nielsen’s usability heuristics to perform expert evaluations (Nielsen 1994):

Visibility of system status– Information should be given to the user via appropriate and reasonably timed feedbackMatch between system and the real world– Language and terms that are familiar to the target audience should be used. Information should be presented naturally and logically. User control and freedom– If a user makes a mistake they must be able to exit the function easily or undo the action without being confronted by confusing and unnecessary screens or dialogs. Consistency and standards– The system should be consistent in terms of words to indicate actions, navigation and the system should use conventions that the user is accustomed to. Error prevention– Always attempt to prevent the error in the design instead of

providing good error messagesRecognition rather than recall– System elements, actions and objects should always be visible or easy to retrieve in order to alleviate the need for recall of previous actions or instructions. Flexibility and efficiency of use– The system should be flexible enough to accommodate experienced and inexperienced users. The system should be configurable to allow access to frequently used actions. Aesthetic and minimalist design– Only important and relevant information should be displayed in dialogues. Irrelevant or unnecessary information will detract or diminish the visibility of important information. Help users recognize, diagnose, and recover from errors– Messages and suggested solutions to problems should be written in language that is plain, precise and constructive. Help and documentation– If necessary, documentation should be focused, concise, concrete and easy to locate

Now let us expand on the four principles of the WCAG 2. 0 accessibility guidelines mentioned in section 2. 1(WCAG 2008) and point out any similarities between these and Nielsen’s heuristics.

Perceivable– Web content should be made available to any or all of the senses – sight, hearing, and/or touch.

Usability guidelines for Visibility of System Status, Recognition rather than recall (Nielsen 1994) will fail for the disabled user if the items in the site are not perceivable.

Operable– Interface objects such as forms, controls, and navigation must be operable independent of the input method

User control and freedom and Flexibility and efficiency of use (Nielsen 1994) guidelines are not satisfied if they are not operable. If a site is very complex or unattractive it can be difficult to operate therefore it should make use of Aesthetic and minimalist design (Nielsen 1994). A site cannot be operated if it does not apply Consistency and standards (Nielsen 1994).

Understandable– The site's content, information and interface must be understandable to the target audience

User control and freedom, Consistency and standards, Error prevention (Nielsen 1994) cannot occur if the content is not understandable. Help and documentation (Nielsen 1994) is necessary to improve understanding. It also not possible to Help users recognize, diagnose, and recover from errors (Nielsen 1994) if the site cannot be understood.

Robust– Sites can be used reliably by a wide variety of user agents such as web browsers, mobile devices and assistive technologies.

In many cases minimalist design (Nielsen 1994) of a website will allow for web standards-based coding techniques to be employed which will allow it to be used on a variety of devices. Also be easier to follow platform conventions in terms of Consistency and standards (Nielsen 1994).

As we can see there is an overlap between the two sets of principles.

This overlap in principles could be the reason that Thatcher et al. (2003) where he suggests that accessibility issues are a type of usability problem hence accessibility is a subset of usability. Conversely Universal usability as conceptualized by Shneiderman (2003) where usability problems are thought

of as a subset of accessibility problems, which expands the scope of usability to include disabled users in usability evaluations. However it is suggested the relationship between accessibility and usability isn’t simply a case of applying a universal approach but that issues also be grouped into categories (Petrie et al. 2007). These being:

Problems that only disabled users experience are referred to as pure accessibility problemsProblems that only able-bodied users experience are referred to as pure usability problemsProblems that both groups of users experience are referred to as universal usability problems

The use of a universal set of guidelines is a good starting point however they will need to be refined to include the various accessibility and usability problems encountered by disabled and able-bodied users.

3. 3 Should accessibility professionals employ usability practices?

Usability practitioners employ numerous methods to determine the effectiveness, efficiency and satisfaction of a project whereas accessibility practitioners will use various techniques and methods to achieve compliance with a set of guidelines.

User testing is used by both sets of practitioners, more so by usability practitioners (Chandrashekar et al. 2006). However the difference being that usability practitioners will use this method early on and throughout the design process (Preece et al. 2006 p412). Accessibility practitioners will employ this method at the end of the project.

Both groups make use of design guidelines (section 3. 2). However guidelines are possibly not the most effective way of evaluating accessibility or usability as they are to be used as guidance but cannot by their nature guarantee the desired results.

There are similarities between the accessibility and usability principles with accessibility guidelines being more technical in nature (Kelly et al. 2007), as they require websites to present a particular level of coding. However there are a number of non-technical accessibility guidelines. It is often thought that by making use of accessibility guidelines or universal design techniques that a site will be accessible by all. However this is not necessarily the case (Petrie 2007).

Usability guidelines can also present problems (Spool 2002). As with the use of any guidelines they can conflict with one another, they can be misinterpreted and misapplied and they do not guarantee results.

In practice accessibility experts will evaluate web sites against guidelines as opposed to user testing. However this has also been found to not be the most effective way of making a website accessible as shown by Disability Rights Commission (DRC) investigation, into website accessibility for disabled people. The study found that designers could not be expected to understand and repair the problems that disabled users experience when visiting a website. To overcome this problem the report suggests that disabled users should be directly involved in the development process (Disability Rights Commission 2004).

Guidelines are important from a technical standpoint however it is also important to recognize that the guidelines cannot accommodate all users all of the time. The areas where the guidelines are not practical or important need to be clearly identified and alternate methods need to be identified in order to achieve accessibility (Kelly et al. 2007). Since the publication of the WCAG 2. 0 in 2008, however, there are a variety of success criteria and methods suggested that could be used to achieve accessibility (Henry 2008).

This being the case guidelines for measuring accessibility is still used predominantly because of the difference in cost between an expert evaluation and user testing and the availability of participants. It is often difficult to get a broad spectrum of users with varying disabilities and therefore accessibility practitioners inevitably end up repeatedly utilizing the same participants for disabled user testing. The reason cost is an issue is due to the fact that accessibility is not built into the project from the beginning and that many do not view it as being of great importance as the number of disabled users is thought to be proportionately very low in comparison with non-disabled users. However there is a strong business case for including disabled users. Christopherson (2007) states:

The combined spending power of the 10 million people with a disability in the UK amounts to £80 billion. There are 6 million people in the UK with dyslexia, with severe cases numbering around 4 million. Many users do not class themselves as disabled even though they may often suffer from disabilities that aren’t physically manifested such as age related issues, colour-blindness or cognitive difficulties. Some websites do not cater for older devices.

By not including disabled users fully may exclude many users from a website which could mean a significant loss in revenue.

In many cases accessibility testing is normally regarded as something that can be quickly done at the end of a project in order to comply with the legal obligations of a project.

This approach to web accessibility is very shortsighted and potentially costly. If accessibility problems are encountered at the end of a project they can be very difficult to rectify after the fact. As is now recognized in the usability field, it is more efficient and cost effective to include usability evaluation from the beginning and throughout a project. This should also the case for accessibility evaluation as promoted by Henry (2007) in his book Just Ask: Integrating Accessibility Throughout Design. The main chapters deal with:

The importance of building accessibility at the beginning and throughout the projectIncluding disabled users and not relying only on standards and guidelinesTips on how to deal with disabled users

It is better to involve disabled users throughout the lifespan of a project rather than relying on guidelines alone. By involving disabled users practitioners may be able to determine accessibility issues and usability issues which may have been otherwise missed in usability testing (Petrie 2007 pp 405).

Accessibility professionals should not adopt usability principles if they are only going to rely on guidelines. However the usability practice of including

actual users in evaluation and design from the start and throughout a project should be adopted.

3. 4 What effect do new technologies have on usability?

As stated earlier (section 2. 1) new web technologies can enhance usability. Is this statement true? Does the ability to add more interactivity to a website improve the usability? According to Nielsen (2007) Web 2. 0 technologies add more complexity to a website where it is sometimes not necessary and divert design resources. In his report he found amongst other things that:

Internet applications were too complexCommunity content has too few users on the InternetFeatures merged from different websites (“ Mashups”) can cause branding confusionApplication type websites will benefit most from the use Web 2. 0 technologies. Most other websites have very few repeated actions thus not requiring the use of this technology.

Therefore as Nielsen (2007) states that efficiency is not as important as simplicity and that modest use of Web 2. 0 technologies can be of benefit, however the benefits of advanced features have little effect in improving the user’s experience.

If used modestly new technologies can be beneficial for certain types of user experience such as web applications.

3. 5 What effect does new technologies have on accessibility?

In a study by Hailpern et al. (2009) it was found that Web 2. 0 applications force blind users to adapt to an inaccessible use model, although the

evolution of technologies such as WAI-ARIA (section 2. 3) and AJAX (section 2. 3) may change this in the future.

Some believe that Web 2. 0 will make it more difficult to create accessible websites. Christopherson via Everett (2006) states that if accessibility is not kept in mind there is a greater chance that Web 2. 0 will cause problems for disabled users.

Basically Web 2. 0 adds a further level of complexity, both in terms of accessibility and usability and this will need to be considered throughout the design process if these technologies are going to be used.

4. Conclusion

To make sites that are usable and accessible we will need to change our thinking of usability. Is your site still usable if sighted people can fully and conveniently use it but it is a frustrating exercise for a blind person? (Clark 2003)

In understanding the concept of an accessible site we have to understand what an accessible site is. A disabled person’s experience of a website does not have to be identical to that of an able-bodied person. If accessibility features are simple and well written they should be unnoticed (Clark 2002).

Clark (2002) reiterates, “ Equality is a misnomer. Equivalency is the goal.”

As can be seen from the above discussion there is an overlap between the definitions and methodologies employed by accessibility and usability practitioners and that there is scope for accessibility guidelines to be

employed by usability practitioners and vice versa. However this is not simply a case of making a universal set of guidelines, as firstly accessibility and usability issues cannot be universally grouped and that there are distinct groups of accessibility issues. Secondly the use solely of guidelines is fraught with controversy and do not necessarily guarantee that a site will be accessible or usable.

Involving users both disabled and able-bodied throughout the project lifecycle is the most effective approach in achieving the most usable and accessible product. Involving disabled users is also makes good business sense.

Web 2. 0 technologies do have an effect on the relationship between accessibility and usability. For them to not have a negative effect they need to be used with discretion always bearing in mind that they add a level of complexity for both able-bodied and disabled users.

Therefore we can conclude that that by embracing the techniques and methodologies and recognizing points of similarity between usability and accessibility practices, and with modest and careful, considered use of new web technologies a web design can be made both usable and accessible.

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