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Reflections on the development of a Holistic Approach to Web Accessibility

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Abstract

The W3C Web Accessibility Initiative (WAI) has a well-established framework for addressing accessibility based on three components: the accessibility of Web content, accessibility support in browsers and accessibility support in authoring tools, with a corresponding set of guidelines for each. These guidelines have been successful in raising awareness in Web accessibility at a political level, but have been less successful than might have been expected influencing the wider promotion and adoption of accessibility in Web technology. This is increasingly apparent as Web content becomes increasingly heterogeneous in terms of source, type, author and function.

Standards, policy and guidelines overwhelmingly focus on accessibility of the end product – i.e. the Web page or site - and not the process used to create it. This is at odds with the transformation of Web-based user goals from receipt of static information to communication, and receipt or delivery of services and experiences. Thus it is the accessibility of the end goal that should be critical, and is dependent on the quality of the route(s) available to reaching that goal - making assessing accessibility of a technical unit such as a Web page less relevant. Instead, we argue a holistic approach is necessary – one that views positively, where appropriate, aggregation of alternatives in a way that allows each route to provide the best possible chance for disabled users to achieve the end goal, even if individual routes may themselves exclude certain groups.

Since 2004 the authors have developed a framework for addressing the accessibility of Web resources, inspired by the holistic use of Web technology in e-learning, building on WAI guidelines but providing the flexibility needed to address the limitations of the guidelines and the diverse ways in which the Web is now being used. This paper reflects how the influence and impact of WCAG has changed over time, and, by reviewing the authors' work conducted in recent years, considers how a more holistic approach to Web Accessibility in a Web 2.0 world can best be achieved.

Section 1: A brief history of Web Accessibility

Through the 1990s, disparate initiatives from academia, industry and the charitable sector existed with the aim of raising awareness of the challenges facing people with sensory, physical and cognitive impairments when trying to access the increasing number of pages available on the nascent World Wide Web. However, it was only with the formation by the World Wide Web Consortium (W3C) of the Web Accessibility Initiative in 1997, and subsequently the publication of WCAG in 1999 as the presentation of existing best practice in inclusive design in the form of a set of guidelines and checkpoints resulted in an authoritative technical definition of an accessible Web page.

WAI also acknowledged that optimal Web content accessibility relied on other factors – namely the quality of the devices being used to access and present that content, and the quality of the devices being used to create that content, and took steps to formalise this tripartite relationship through the publication of two additional sets of guidelines for Web accessibility (Chisholm and Henry 2005), the others being:

- W3C Authoring Tool Accessibility Guidelines (ATAG) – guidelines defining best practice in ensuring that tools for publishing Web content can be used by authors of all abilities to create optimally accessible output.

- W3C User Agent Accessibility Guidelines (UAAG) – guidelines defining the accessibility characteristics of a tool that facilitates navigation to and display of Web content. This covers conventional browsers and assistive technologies dedicated to facilitating Web access.

The WAI tripartite model thus defined optimal accessibility as being achievable through encouraging creation of WCAG-conformant Web content using ATAG-conformant authoring tools, and accessed by end users using UAAG-conformant browsers.

Over the subsequent years since publication, WCAG became a respected and influential definition of best practice, influencing Web development and raising the profile of Web accessibility as an issue.

Examples of the influence of WCAG on Web accessibility

Some indicators of the positive influence of WCAG include:

- **WCAG as the basis of other standards and legislation.** WCAG became referenced by, or influenced the drafting of, a number of other pieces of legislation, policy and standards relating to accessibility of Web based content (W3C 2006).

- **A basis for performance measurement** The presence of WCAG and its conformance mechanism allowed evaluation of Web pages against a recognised standard, enabling cross-site or time-based comparison of performance.

- **Specifying Web accessibility in a commonly understood language:** WCAG and its conformance mechanism provided a means by which those involved in commissioning or specifying Web sites could state accessibility requirements in simple, unambiguous terms.

- **A motivation for Web evaluation tool development**: The existence of WCAG inspired a raft of accessibility evaluation tool development, aimed at automatically evaluating or supporting manual evaluation of specific WCAG checkpoints. Tools range from those inspecting code quality to those enabling checking of colour contrast levels.

- **Inclusion in the 'Web standards' movement**: The credibility of WCAG was recognised by its promotion by the Web standards movement[1] along with other, more conventional technical specifications such as those for HTML, CSS and Ecmascript.

- **Inclusion in education initiatives promoting best practice in accessible Web design.** WCAG has become a tool with which Web design educators can raise awareness of accessible design techniques amongst students (Petrie and Edwards 2006).

- **Awareness raising of benefits of accessible design to other Web users:** Through documentation, and comparison with other definitions in best practice Web design, WCAG demonstrated instances whereby accessible design also benefited other groups of users, or supported other design objectives, most notably search engine optimisation (Hagans 2005) and design for access on mobile devices (W3C 2008).

- **Emergence of an 'accessibility industry'.** As awareness of accessibility grows, so in many countries an 'accessibility industry has emerged,' Pioneered by organisations in the charitable and academic sectors, accessibility related services such as Web audits, user evaluations with disabled people and accessible design consultancy are available from a wide range of companies.

As professional awareness of the importance of accessibility has grown, the subject has moved beyond a topic only for academic discussion to influential industry conferences such as SXSW in the US and @media in the UK. Accessibility is an increasingly regular topic in professional Web design magazines, is the subject of a number of books, and is also the subject of many Web sites providing advice and resources on accessible Web design. The evolution of the 'Social Web' has seen Web accessibility become the focus of a number of discussion fora and Weblogs, encouraging sharing skills, new design approaches and exchanges of opinion.

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[1] Web Standards Project: http://www.Webstandards.org

Limitations of WCAG

Yet, while there are highly visible signs of WCAG's influence on awareness of Web accessibility, at a technical and political level, regular surveys indicated that Web sites persistently failed to achieve the level of WCAG conformance that might have been expected. The publication of WCAG 2.0 is expected to go a long way towards addressing accessibility issues arising from the shortcomings of WCAG 1.0 as a definition of best practice that no longer reflects the evolution of the Web and Web technology. Beyond this, though, this there are other challenges that may prevent even WCAG 2.0 from being as effective as it could be in raising accessibility levels of Web resources.

Accessibility of interactions, not pages

The Web has evolved from a passive collection of pages primarily to be read, with interaction generally limited to simple submission of data via a form or playing a multimedia clip, to one where users have become content contributors, and where user interaction and control, and subsequent page response has become significantly more advanced. WCAG's focus was on the accessibility of a Web document or page, which encouraged treatment of pages in terms of accessibility assessment as isolated and discrete objects - defined as the content of an HTML file plus any referenced style sheets and multimedia content. By contrast, task-based interactions may require navigation through a series of pages, potentially in multiple ways to achieve the same objective, yet the framework provided by WCAG is not geared to a task-based approach to accessibility assessment, and other methods may be more appropriate (Brajnik 2006).

W3C vs proprietary formats

WCAG promoted the use of W3C technologies on the premise that such technologies had accessibility features built into their specification, whereas proprietary formats typically did not have comparable support. However, arguably influenced by the benefits of conformance by technology vendors to the Section 508 accessibility standards, the Web has evolved to one where diverse formats such as Adobe Flash and PDF have included much-improved support for accessibility. In the meantime, some W3C formats lauded for their potential to support accessibility have failed to gather the same enthusiasm (consider the relative popularity of Adobe Flash vs SVG as a tool for developing animated online content).

WCAG as technical standard rather than an indicator of accessibility

The presence of WCAG as a technical definition of accessibility certainly helped to raise the importance of accessibility amongst developers whose primary motivation is technical quality of the work they produce, defined by conformance with standards or use of particular technologies and formats, as opposed to usability by humans. In some cases, though, it seemed that WCAG conformance,

measured by an evaluation tool's results, overrode the experience of actual users (WebCredible 2004). Several anecdotes indicate developers who have compromised real-world accessibility in order to achieved perceived 'accessibility' (Broome, undated).

Realisation that WCAG did not cover all accessibility problems

The issue described in the previous section was driven home by the results of a major UK Web accessibility survey (DRC 2004), which reported that there was a mismatch between WCAG conformance and actual accessibility as experienced by disabled users. In a robust defence of WCAG, the W3C argued that most issues highlighted as being beyond WCAG were in fact covered by checkpoints in ATAG or UAAG (Brewer 2004). Acknowledging this, though, meant that designers had to accept that some accessibility issues were beyond their control, unless they took steps to mitigate them by extending Web page content to compensate for shortcomings in browser capability through, for example, text-to-speech solutions or text-resizing. This realisation that Web accessibility required not just WCAG conformance, but UAAG conformance, ATAG conformance – and user conformance – served to complicate perceptions and arguably dilute the impact of WCAG.

WCAG 2.0 redefines technical accessibility

Many of the shortcomings of WCAG 1.0, particularly those of a more technical nature, have been addressed in WCAG 2.0 which, despite a long and often acrimonious drafting process (see for example Clark 2006) appears finally (as of August 2008) to be on the verge of publication as a formal W3C recommendation. It remains to be seen whether an improved technical definition of accessibility will help to raise accessibility levels of Web content, but the difficulties in the creation of WCAG 2.0 as a technical standard of how to accommodate diversity amongst Web users demonstrates to us that the social challenges surrounding Web accessibility are to a large extent independent of the technical quality of any guidance offered.

Section 2: Web Accessibility in the UK and the emergence Holistic Accessibility

The authors have both been involved in the promotion of Web accessibility, initially in the field of Higher Education in the UK for many years – since 1999 (Sloan) and earlier (Kelly). In this section we balance Section 1's general observations of WCAG's influence by reflecting on the journey we have travelled in promoting Web accessibility, in achievements and shortcomings, in trends of uptake, and describe how our views have moved from a purely guideline-based definition of Web accessibility to a more holistic view.

Early days – evangelising WCAG

The early days of our work focused almost exclusively on evangelising and supporting uptake of the newly-published W3C Web Content Accessibility

Guidelines (WCAG), largely through involvement[2] with the UK's Disability and Information Systems in Higher Education (DISinHE) project, established in 1998 and based at the University of Dundee. At this stage the key challenge was raising awareness of the concept of Web accessibility in the Higher Education community, and this strategy involved developing resources focusing on accessible Web design, using WCAG as a technical framework, and promoting techniques for evaluating Web accessibility.

At this stage, there also began to emerge a demand for dedicated accessibility audits of Web sites, and at Dundee a separate group was established in 1999 to carry out work on a more commercial basis – the Digital Media Access Group (DMAG[3]). DMAG developed a Web accessibility auditing methodology combining automated accessibility assessment tools with manual usability inspection methods, and applied this to early work including a number of Web sites supporting the UK Higher Education sector (Sloan et al 2002). This methodology, with some minor modifications, remains the basis on which DMAG audits are carried out to date, and reflects to a large extent the evaluation methodology promoted by WAI.

Moving on or standing still? – 'beyond guidelines' versus 'levels of accessibility remain disappointing'

The period that followed saw the profile of Web accessibility as an important issue continue to grow, indicating the political success of WCAG. The legal case involving the Sydney Organising Committee of the Olympic Games (SOCOG showed for the first time that the organisation providing a Web site had acted unlawfully in excluding disabled people from being able to use the site. In the UK Higher Education sector, the Techdis service (http://www.techdis.ac.uk) was established to support the sector by providing advice and support on Web accessibility issues, while also generating knowledge through various research projects focusing on accessibility, technology and education.

Around this time, several independent Web accessibility surveys were published, without exception reporting that levels of accessibility found were 'disappointing'. While these surveys tended to vary in terms of type of Web site visited, in scope of site (frequently only the Home page was visited), they overwhelmingly utilised one of the growing number of automated accessibility checking tools to rapidly generate quantitative data on accessibility performance. The lack of human involvement in checking the subject pages may limit the conclusions that can be drawn from these surveys, yet the paradox was emerging that while publication of the results of such surveys in more mainstream media raised awareness of accessibility, the survey results over time did not seem to indicate an improvement in overall accessibility.

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[2] Sloan as a Project Officer with DISinHE and Kelly as a steering group member.

[3] Digital Media Access Group: http://www.dmag.org.uk

The impact of the DRC survey, in terms of clarifying the role of WCAG amongst other WAI accessibility guidelines (discussed in **Realisation that WCAG did not cover all accessibility problems**), was a motivation for the authors to look more critically at the impact of WCAG and the WAI model of accessibility. We realised that this may be one reason why, despite evangelising the importance of Web accessibility and the role WCAG 1.0 had to play in developing accessible Web sites, the levels of accessibility of Web sites in the UK and elsewhere did not appear to be significantly increasing.

In fact, there were indications that new types of accessibility barriers were emerging, signifying that awareness of accessibility may have been growing, but implementation of accessibility guidelines was not always appropriate. In some case this was a symptom of the 'accessibility is a technical challenge, not for humans; issue previously described. Also clear, though, were situations where WCAG checkpoints were simply not being followed as intended, betraying a lack of understanding as to the principle behind a checkpoint, An example was, in the authors' experience, a move away from missing alternative text from images as being a major problem towards alternative text that was inappropriate (see Thatcher 2003 for a classic example).

Beyond the technical implementation issues, though, there were also signs emerging that accessibility 'compliance' was having an adverse effect on innovation and creativity, particularly in the e-learning sector. With WCAG conformance increasingly becoming mandated as policy, the authors heard many worries over the impact on accessibility of use of scripting to enhance Web site functionality, use of multimedia and content in proprietary standards such as Adobe's PDF and Flash formats, conflicts between code validation and other practical requirements, and even more mundane features such as tables. The result appeared to be signs of conservatism in terms of Web site development in an attempt to stay within the bounds of WCAG.

Emergence of a Holistic Approach to Accessibility

Led by developments in the e-learning sector, there was a realisation that Web accessibility needed to be treated within a wider context of the learning and teaching environment. Early work developed a holistic model (see **Figure 1**) for considering accessibility - not just in the isolated terms of WCAG conformance of a technical object such as a Web page, but also contextual factors such as the aims and purpose of the resource in question, the audience and usage environment, and details of any other pre-existing means of achieving the same aims. The overarching aim of this model was to demonstrate that WCAG conformance should not be seen in isolation as a guarantee of universal accessibility – and usefulness of an e-learning resource (Kelly, Phipps and Swift 2004; Kelly, Phipps and Howell 2005a; Kelly *et al* 2005b).

Figure 1: Holistic Accessibility

This work was extended to consider how a more holistic approach to accessibility could be implemented beyond education, where theory and practice in e-learning as a means of enhancing traditional learning approaches had promoted a culture of collaborative, blended approaches to provision of information and experiences. The Tangram Model (see **Figure 2**) was developed to attempt to visualise the approach of using WCAG as one of a set of tools and techniques all aimed at using the Web as a tool to maximise access to information and services (Sloan et al 2006). Other such tools might include use of personalisation of delivery based on knowledge of a user's access requirements, as promoted by the IMS AccessForAll approach to accessibility (DCMI 2008), or even other, potentially more effective media streams to optimise accessibility for particular groups (Carey 2005).
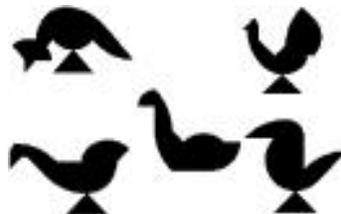

Figure 2: Tangam metaphor

Separately, the Stakeholder Model of Accessibility was developed by Seale (2006), which described the often complex relationship between drivers for pursuing optimal accessibility and all stakeholders who can influence or contribute towards an organisation's progress towards accessibility goals. This model emphasises the need for a collaborative and co-operative approach to accessibility as the best way in which good practice can become enshrined in organisational policy, and stresses the limitations of addressing accessibility challenges at an individual level, an identified weakness of any accessibility policy (Urban and Burks 2006).
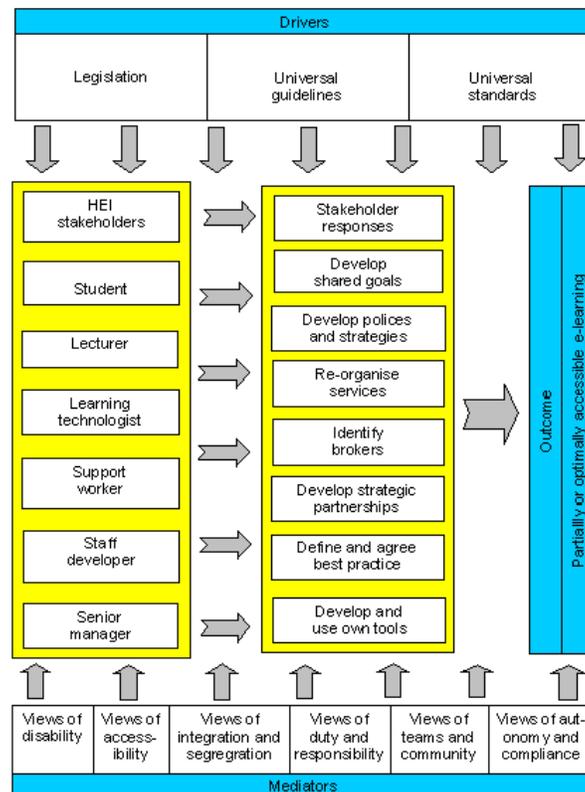
Figure 3: Stakeholder Model of Accessibility

The Stakeholder Model and Tangram Model share many ideals, not least that they both adopt a holistic approach to accessibility, concentrate on optimising the process towards using the Web to making information and experiences as accessible as possible, in whatever way is most appropriate to the circumstances.

Reaction to the Holistic Accessibility concept

The authors received encouragement for the validity of a holistic approach through two Accessibility Summits – meetings of accessibility advocates from across the UK's education, government, cultural, charitable and broadcast media sectors. At these meetings there was broad consensus that a 'beyond guidelines' approach was valid and appropriate as an extensible, context-sensitive, technology-neutral and ultimately common-sense approach to Web accessibility.

During this period of discussion and consolidation of the approach, a number of examples emerged where a holistic approach to accessibility seemed to be particularly well suited. These included situations where withholding content on accessibility grounds (for example digitised video without captions) might deny a large majority access to valuable cultural information, or where provision of accessibility features might be particularly challenging (for example digital cultural artefacts that provoke varying subjective reactions depending on the viewer).

The holistic approach to accessibility fits particularly well with the practical reality of the Web as a mass of legacy content, which may have been designed without accessibility in mind, or converted to digital format rapidly and in bulk. It accepts that there are real-world obstacles to achieving universal accessibility, but also that there can be accessibility problems if potentially valuable content is withheld – for example, consider that multimedia (whether captioned and audio described or not) can be an effective accessibility solution for those who have difficulty accessing textual information (Slatin and Rush 2002). Even in today's Web 2.0 of 'user-generated content', the challenge remains of how best to address the accessibility of large quantities of content created by people without the knowledge or tools to ensure this content is created with accessibility in mind. What must be emphasised is that, in the examples above, holistic accessibility does not mean forgetting about those excluded because of the inherent accessibility barriers present, but that information with accessibility problems can be published so long as these barriers be identified, and appropriate steps taken to support people who may be affected.

Reflection: Holistic Accessibility and Web Accessibility Policy and Standards

Clearly, for a holistic approach to accessibility to have the greatest influence, it must be reflected in policy at a local level and standards at a national and international level.

In the UK, it can be argued that the legislation contained in the Disability Discrimination Act (DDA) has always indirectly promoted a holistic approach to Web accessibility, in that the legislation itself refers to the provision of goods, facilities and services, rather than objects such as Web sites. Therefore without a legal definition of technical accessibility, unlike Section 508 of the Rehabilitation Act, the DDA does not enforce a guideline compliance approach to accessibility, although most commentators agree that conformance with WCAG would be a demonstrable attempt to make the 'reasonable adjustments' required by the legislation (Sloan 2001). Thus, the DDA provides scope for a holistic approach – assuming, of course, that disabled people affected by any Web accessibility barrier that cannot be easily overcome are catered for in an equitable way.

Also in the UK, the publication of PAS 78 – Guide to Good Practice in Commissioning Accessible Web Site (BSI 2006) was an important step towards the standardisation of the *process* of creating accessible Web sites. PAS 78 focuses on commissioners of Web sites – people who may not have the technical skills to express suitable demands for Web accessibility, nor to check that these demands have been met – and defines the process for specifying, commissioning and evaluating Web sites in order to ensure optimal accessibility. Importantly, PAS 78 references W3C documents as far as possible, thus supporting these technical standards as valuable tools in the pursuit of optimal accessibility.

By contrast, there are signs that work elsewhere, particularly in the European Union (EU) continues to focus to a large extent on attempting to standardise Web

accessibility through technical definitions of accessible Web sites in an effort to ease the process of benchmarking and hence enabling comparisons across time and between sectors and political entities. While this work may well have merits in contributing towards enhanced awareness of Web accessibility, there is a danger that it may perpetuate the problems already identified with WCAG. Meanwhile, the UK Government continues to promote a strict guideline-based approach to benchmarking accessibility (COI 2008), although the success of this approach seems to be in question given the number of government sites that have been found to breach internal standards, yet appear to have gone unpunished.

The authors have also experienced informal feedback that a holistic approach can be seen to be permitting a lax approach to accessibility, and that promotion of any solution that involves aggregation of multiple resources in order to provide multiple routes to the same destination – whether information or experience – can lead to segregation and sub-standard solutions for disabled people. Arguably this view also led to the removal of the 'baseline' concept of WCAG 2.0, where Web authors would have been able to define a baseline of browsing technologies a user would be expected to use, and against which accessibility would be measured. We argue that personalisation is the ultimate goal of user-centred design, and is absolutely not the same as segregation; while we also argue that to fail to acknowledge that this approach can have values can lead to the assumption that accessibility is all or nothing and that a resource is either 'accessible to all', or it is 'inaccessible to anyone'.

Conclusion

To close, we must make it clear that despite the problems already noted, there is still a need for a technical definition of best practice in accessible Web design. For the near future, that job will be best done by WCAG 2.0, even given accepted shortcomings in the scope of the guidelines, particularly reflecting gaps in knowledge in terms of supporting learning disabled Web users (Seeman 2006) and older users, for whom the nature and dynamicity of a combination of impairments, allied to social factors, can present additional challenges to Web accessibility – and is therefore the subject of a new WAI investigation, the WAI-Age project[4].

Yet, while WAI and W3C remit will always focus on the Web, our involvement in and experiences of the Web accessibility movement over the past decade has made us realise that we much acknowledge that the Web is just a tool, albeit an extremely powerful and pervasive one, available to help us provide people with information, with experiences, with a means to communicate, share, and trade. The challenge, therefore, is to promote holistic Web accessibility to policymakers as a pragmatic and effective approach to Web accessibility within a wider context of accessibility of real-world goals – an approach that balances using WCAG as a respected definition of best practice for Web accessibility while also making

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[4] WAI-AGE project: http://www.w3.org/WAI/WAI-AGE/

sure that, where strict application of WCAG would degrade the quality of the Web browsing experience for a majority, appropriate alternative solutions are provided for those affected - so long as these solutions can be clearly justified.

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