



UNIVERSITY OF
BATH

Nevile, L. and Kelly, B. (2008) Web Accessibility 3.0: Learning From The Past, Planning For The Future. In: ADDW08 Conference, 2008-09-22 - 2008-09-24.

Link to official URL (if available): <http://www.ukoln.ac.uk/web-focus/papers/addw08/paper-2/>

Opus: University of Bath Online Publication Store

<http://opus.bath.ac.uk/>

This version is made available in accordance with publisher policies.
Please cite only the published version using the reference above.

See <http://opus.bath.ac.uk/> for usage policies.

Please scroll down to view the document.



University of Bath *Opus*
Online Publications Store

<http://opus.bath.ac.uk/>

COVER PAGE

This is the author's accepted version of a paper made available in accordance with publisher policies.

Author(s): Kelly, B., Nevile, L.

Title: Web Accessibility 3.0: Learning From The Past, Planning For The Future

Year of publication: 2008

The citation for the published version is:

Nevile, L., Kelly, B., 2008. Web Accessibility 3.0: Learning From The Past, Planning For The Future. In: ADDW08 Conference, 22-24 September 2008, York, UK.

The University of Bath Opus website (<http://opus.bath.ac.uk/>) provides information on usage policies. Please scroll down to view the document.

Web Accessibility 3.0: Learning From The Past, Planning For The Future

Brian Kelly UKOLN University of Bath Bath, UK +44 1225 383943 b.kelly@ukoln.ac.uk	Liddy Nevile La Trobe University Bundoora Australia +61 419 312 902 liddy@sunriseresearch.org
--	--

In this paper the authors think afresh about the problems of social inclusion and argue that "Web accessibility 3.0" must be very different from the WAI WCAG 1.0 and adopt more holistic accessibility approaches if it is ever to be effective.

The paper provides a critical reappraisal of the limitations of the WAI approach to Web accessibility, arguing that its political successes have failed to be supported by the development of practical, achievable and future-proofed guidelines for Web authors.

The paper goes on to question whether the holistic approach to Web accessibility, which seeks to make use of WCAG guidelines in a pragmatic fashion, which acknowledges the importance of the context of use, the resource implications and the requirements to support a wide range of requirements beyond accessibility, provides a scalable approach which is capable of addressing accessibility in a Web 2.0 environment, in which many users exploit services which are no longer managed within the institution.

An alternative approach to Web accessibility is described which seeks to exploit the scale of the Web. The approach, which has been labelled Accessibility 3.0, has parallels with the ideas surrounding 'Web 3.0' which seeks to build on the rich interactivity provided by Web 2.0 with deeper exploitation of the relationships between resources using Semantic Web approaches.

The paper concludes by revisiting the lessons learnt over the decade in the approaches taken to seeking to enhance the accessibility of Web resources and argues the need to adopt a critical approach to the alternative approaches described in this paper.

1. Introduction

It is hard to see the future with eyes of the past. In our accessibility work we are all too often grounded, at best, in the present, struggling to do more of what we have done previously, desperate to achieve more success than we have to date. It is not always the best way to work. In this paper, we jump into a future and try to think afresh about the problems of accessibility. We then take the cautious step of checking backwards on the compatibility of what we are doing now to make some suggestions for immediate action.

2. Web and Accessibility Evolution

An interesting characteristic of the Web is that it evolves. New things become available, early adopters play with them, and the 'new' things leek out into popular use (Gmail, Skype, Google Earth, etc.) or perhaps fail. It's not easy to talk about an evolving phenomenon so when it was suggested a few years ago that we might think of the new practices and current technology as Web 2.0 (O'Reilly, 2005), the term was quickly adopted.

We think of Web 1.0 as the Web we browsed. Some of us published, but if so, we published Web sites. We made composite resources that consisted of a set of pages, with a navigation structure, and a mix of media on each page. We started early, in some cases, but soon enough we were into dynamic sites, with interactive components and any other features available.

There was alarm within the disability communities as this was happening – people who had been able to use the earlier technology to improve their lives suddenly found the technology running away from them, alienating them. There was a quick response to this from the W3C and the Web Accessibility Initiative [WAI] was chartered to provide guidelines for content developers and authoring and access tool developers to ensure the Web would be accessible.

WAI started with the pre-Web ideas that supported people with disabilities in the printed era. SGML was a computer mark-up language that separated content from the instructions about how it was to be presented. WAI adopted this idea and extended it to define CSS mark up so that Web content could be separated from how it would be presented. This allowed for multiple formats for presentation. It was a good idea. In addition, WAI assumed that they could extend the idea to specify ways in which content could be developed according to a principle called universal design. The idea is that a single resource can be made available in a sufficient variety of redundant ways so that everyone can access it. This is a 'nice' idea. Collectively, we could call this the Accessibility 1.0 approach.

Today most people work in an environment we call Web 2.0. In this environment we, as users, contribute to the Web. We comment, tag, post and add resources to the Web, and all over the place, not just on our own Web site, if indeed we have one. We use different sites for different purposes – store photos on Flickr, videos on YouTube, presentations on SlideShare, details of our pals on FaceBook and even our pets on DogBook (<http://dogbook.ca/>). Many of us now collaborate using tools that support this

such as Google Docs and Elluminate (<http://en.wikipedia.org/wiki/Elluminate>). Some of us use 'online desktops' and practice 'cloud' computing, not knowing or caring what is on our computer and what is out somewhere on the Web.

The W3C WAI's response to Web 2.0 has been a new set of guidelines for content developers and tool developers. While we are very supportive of this work, we now know we cannot rely on encoding guidelines alone to solve the accessibility problem (DRC, 2004). We thought about our failures and realised that what we were doing was not enough. We needed to be far more holistic (B. Kelly *et al*, 2005), to have processes and techniques, and variability, and human usability testing (DRC, 2004), and lots more. We even enlisted the services of a cute tangram rabbit that suggested there are many ways to make the Web accessible, not one way (B. Kelly *et al*, 2006). We called this holistic approach *Accessibility 2.0*.

Sadly, we have been telling people about our ideas for a while but we already know this is not enough. We are still depending too much on people: developers do not make perfectly encoded resources; managements do not understand accessibility and do not make it a priority, encoding specifications are never likely to be perfect, even if they are applied, and universal accessibility is not necessarily optimal for the individual.

Web 3.0 is already being discussed.

The ideas that are captured by the term Web 3.0 are associated with the term Semantic Web although there is not clear agreement about how that will be realised. Content can be an inert object or an active object. The big idea is that content itself will contribute to the Web. By this, we mean that two pieces of content, for example, may recognise their common characteristics and connect themselves, possibly logically. The quantity of information will also make a difference: already Google can rely on a million translations of an expression to determine how to translate it in a given case, rather than having to build 'intelligent' translation systems.

There is no such thing as a 'version' of the Web, of course. The Web simply evolves. But commentators have made it easier to talk about the changes in the Web by adopting a model of versions. Technological evolution does not just happen: we make our future. Accessibility 3.0 is already on the drawing board. It should be ready to exploit the opportunities offered by Web 3.0.

Think of what we all do now with word processors, databases and spreadsheets. Even those of us who struggle to keep our houses organised can produce professional-looking texts, manage our financial arrangements, organise our wine with easy-to-use programs on our laptop computers. We input our data, we label it, and we let the computer deal with it for us. We work with our computers by contributing the information and letting them do the work. We need to work on the accessibility problem *with* Web 3.0.

3. Progress and Evolution

We are attracted to Kevin Kelly's view of the long-term evolution of the Web (K. Kelly, 2007a, 2007b). He considers that the Web was first just a network of computers, then of Web pages, now of data and soon of everything. He anticipates a shift from a 'web' to a 'one' (somewhere after Web 3.0). Kelly describes what we are collectively building as a giant machine, with lots of smaller gadgets, computers, phones, fridges, etc, all hooking into it – drawing on it for our particular needs at any time. Kevin Kelly does not seem to think we have 'one' yet, but he points to clear shifts from our starting point and urges us to think about what has to happen to make the changes, and what will happen in their making.

To advance from linking computers into linking pages, enabling browsing, we relinquished our control of links. Usually we think of how we gained linking capability: Kelly points out that we lost, or rather gave up control of who could link to us. To gain what we got, we gave up something. That was for Web 1.0.

To build Web 2.0 with the millions of pages of content in Wikipedia, we let *ordinary* people write an encyclopaedia! We saw Amazon forget the most popular books and make a fortune from the 'long tail'. We saw the market for cameras and phones ride on the back of cloud storage and applications (e.g. Flickr) and universities giving away their teaching materials (OCW <<http://www.ocwconsortium.edu/>>, iCampus, <<http://icampus.mit.edu/>> and iLabs, <<http://icampus.mit.edu/iLabs/>>). Information is being freed from proprietary software, from institutional control: it is like currency – of no value in itself but of enormous value for what it facilitates.

For Web 3.0 we are going to depend on data knowing its connections with other data. To achieve this, we have to support data, such as "I went to Tivoli", with data that helps the computers read, and to do that, we must be kind to the computers. They cannot read in the way we can. They need metadata to discover which Tivoli we are talking about; where it is; perhaps that someone else might call it 'Tibur', and even that it is a place not a commercial entity's brand name. And who is 'I', what does 'went' mean – was it a process of linking through Web pages or catching a bus? – and so on.

Our children move freely and safely about the cities where they live. They carry mobile phones and are in contact whenever they need to be. They are also discoverable because of their phones. The children can associate freely with their friends, travel to places of choice, and maintain connectivity, security. Just as the children are freed by the technology, information and services can be freed by their connectivity.

4. A Fresh Look at Web Accessibility

So what have we, the authors, to offer?

We recognise that not everything on the Web will ever be accessible. That is an important position to work with. It is not even likely that accessibility will cross borders of languages, nations, cultures, disciplines, completely.

Perhaps more significantly, we recognise that an individual user does not have to be assured that some content is available to everyone else: the issue for them is whether it is accessible to them, at the time and in their context.

We recognise that different communities may have different needs and that the same person may have different needs at different times and places.

We don't define accessibility by disabilities but rather by abilities, by functional needs, and we find 'inclusive' a more effective term than 'accessible to people with disabilities' (Treviranus & Roberts, 2006). We don't need to know what permanent disabilities people have, or even why they have certain needs and preferences. We just need to think about making our world socially inclusive (Oliver, 1990), and do the curb-cut thing. How many babies in pushers have been on ramps originally 'added' to buildings for the 'disabled'? Why do we need to think like that? Ramps are useful to all sorts of people so it's a good idea to have them.

What we set as our overall goal is, then, that those within a community should be able to participate in that community as a result of the 'inclusive' activities of that community, including its discourse. We would even like communities to be able to interact with each other, forming inclusive bonds between themselves.

To achieve our goal of inclusion, we have to be inclusive of all the strategies and techniques we yet know for increasing the accessibility of the Web.

Setting the right goals for participation is an inclusive activity. Making usability a measured quality of resources is, we think, an inclusive activity. As well as general usability, we recommend contextual relevance (Kelly *et al*, 2006).

Paramount, however, is the opportunity for the user to make the choice about what they will tolerate. In the final specifications for the encoding of publishing instructions for Web content, the user is able to override all other instructions to the computer with their own, however they choose to prioritise and combine them. 'Accessibility' should respect the rights of users in the same way. An inclusive Web 3.0 would offer this.

So we have what might look like competing goals: we want Accessibility 3.0 to add to the established mix of strategies. We want the information to automatically organise itself for the benefit of users' needs and preferences but, at the same time, to leave the users with the choice of how this happens.

5. Accessibility 3.0

If Kevin Kelly is right, when we gave up control of the links to our content, a little magic happened. When we stopped worrying about where our content is physically, we enabled some more magic. What if we now let the Web in on a little secret, and tell it what we want? Can we do this in a way that lets us change our requirements as we change our circumstances? Can we do it without sacrificing our privacy? Clearly we could not expect to match

resources to our needs and preferences without the significant technologies that are now available.

The guidelines for building systems (browsers and authoring tools) and publishing content are incomplete but that is not the main problem. They should not be expected to solve all the problems. They should not, the authors assert, even be used to assert the 'accessibility' of resources (Phipps *et al*, 2005). As this is a strictly personal choice, as it is peculiar to the individual user, at the time, and in their immediate context, no absolute declaration of accessibility can make sense. Besides, access-quality should be a choice for the user, not imposed upon them.

We have recognised and supported the 'post-production' technologies that are appearing on the Web. Many of these take the form of services that transform, in some way, resources for the benefit of users with identified needs (such as giving people who cannot see tables, immediate access to the information in those tables - see Vision Australia at <<http://www.visionaustralia.org.au/ais/>>). We are pleased to note that IBM now supports a service where users can describe resources for others who cannot see them (Williams, 2008).

We have engaged in work to define metadata for describing characteristics of resources that are known to be of relevance to users, especially those with dependence on assistive technologies. Unfortunately, so far we have only managed to determine what we think of as shared vocabularies for such descriptions (ISO/IEC 24751-1,2,3). We are still working on specifications for interoperable metadata (ISO/IEC CD 19788-1). Nevertheless, even with what has been achieved it is possible for a user to establish a set of needs and preferences and to use applications to match resources with appropriate characteristics to those needs and preferences (Nevile, 2005a). This can be done in real time and anonymously (Nevile, 2005b).

The Fluid project (<http://fluidproject.org/>) is working on different types of interfaces that users will be able to swap into their systems according to their choices at the time and in the context.

We are now ready to invite the Web, the 'one', to start supporting the work of the Web that we want to depend upon. This means, beyond the technology, we trust Web users to identify resources so the resources know when they are needed and where to show up for duty.

Fortunately, some users are already beginning to do the labelling that we are calling for, both unconsciously (inadvertently while doing something else) and consciously (by adding metadata to resources or using a tagging service).

Expert developers of alternative format resources or resource components know how to describe their alternative formats but are not yet publishing them widely nor providing access to the descriptions. This is partly a copyright problem, because often the only way to get access to the alternative is to be registered as a person with a disability. It is also a problem because there is

not yet enough demand for such openness. It is just beginning to dawn on those responsible for alternative formats that they are often duplicating work because they do not know that others have done the work before them. They are also learning that they can use the same applications to provide information about access rights as they use to provide it about accessibility.

Discoverability does not guarantee access, or accessibility, but without it, the accessibility characteristics might not be known until too late, and the access might never be sought.

6. Web 3.0

If Web 3.0 is to be a world in which data is working with data, and does not need the immediate intervention of humans, how might this be achieved? The problem of making data that can work is being addressed by Semantic Web experts. What we need to do is engage people, users, with it.

If we return to Kevin Kelly's ideas, we are reminded that all the devices will be part of the Web. It's true that even today users of a proliferation of devices find it very convenient when they can move from one to the other without losing contact with their favourite resources. This means their electronic world needs to be device independent. For this, resources need to be constructed for whatever device they are using at the time. This is a process that can be automated. The metadata required can be communicated automatically, by the device to the content server. We cannot but expect this sort of adaptation to become the norm.

The provision of resources needs also, however, to be responsive to the user's choices within the capabilities of the devices and this is what users will need to tell the Web so it can tell the servers.

Having asserted that we are not interested in defining people by their disabilities, or even the disabilities of people, we do need to be able to describe the functional needs of users, at the time and in the context, in an anonymous way. This is not very different from defining a resource; it is simply an abstract set of needs and preferences. Such descriptions can float about on the Web. They may need a label to be discoverable, and applications somewhere that can be used to make changes on demand, but they do not need to be identified by reference to individuals (Neville, 2005b).

We need to tell users about how to make their preferences known and how to demand they be respected.

The other thing we need is for there to be tiny pieces of information available, all knowing a little about themselves. Who, we might ask, is going to bother to publish enough such little bits of data? Easy – has to be the answer already in Web 2.0. The social networking sites already gather an enormous amount of such information: here a photo in Mary's album, here a word that says the album is of the day at the beach, here a picture that says 'Brighton pier', here a photo that says Brighton, Melbourne, in all its glory, and so on. These tiny bits and pieces are not firm data but they are very suggestive. While many

users are posting what, in fact, are rather large bits of data, others are using Twitter to add half a sentence, on a regular basis, providing a lot of information to a network of machines, to the Web.

The interesting thing about this kind of publication that is now so popular is that the users posting it are not doing any more than adding a fragment of data at a time. A blog is a Web site where everything but the latest note remains static. This represents a huge shift from the publication of pages, as was the practice in Web 1.0 days. But there were only a few publishing in Web 1.0 and there are billions of publications in Web 2.0. Flickr, Twitter, blogs, all take away the need for attention to the presentation part of the publication exercise and place it more directly on the information itself. Such applications get input, store it and serve it back to the Web. The input comes from phones, computers, kiosks, without making any difference to its validity or utility. But it often comes accompanied by useful metadata that can be stored in the labels that will make the content discoverable. For example, an image sent in to the Web from a phone is likely to carry with it information about where the photo was taken (GIS data), when (time and data), and even by whom (albeit they might be identified by an anonymous screen name). Immediately the image can start to make connections.

7. Metadata

There is sufficient literature that explains what metadata is, how it works and what it should do. There is no need to repeat that work here. On the other hand, very little of that literature relates to the definition of the aspects of resources that will need to be described to support accessibility in the future.

Metadata is equivalent to the contents of a catalogue record with the proviso that it is machine-readable. That is, it is useful to a computer application.

Metadata, or catalogue, searches are familiar to many. There is a problem still to be solved with respect to the discovery of alternative resources or resource components, when they are needed. If a search finds a resource that contains an image, but the image cannot be seen by the user, they will need a description of it. That description might be associated with the resource. More usually, however, it is not. In this case, the user needs a service that will describe the image or to discover an existing description somewhere on the Web. In fact, they need to discover the service or the alternative. If that is done immediately and successfully, for example when they search for the resource, they just need to have the description substituted for the image. But if a description is not found, it can be difficult to know what to search for when looking for the service or alternative. That is, unless the image itself has been labelled in such a way as to make it clear what alternative would be wanted.

Currently we do not know how to determine the subject of the component resource, if it is not already labelled, so that we can find an alternative for it. We think of the resource components being distributed across the Web and assume some will, by virtue of being part of the Semantic Web, find themselves. Others will have to be associated somehow.

Our final optimistic point lies with the applications we use. Previously proprietary software exploited non-standard features to promote market advantage. Such features often did not support accessibility but nor do they support the interoperability of content that cloud applications want to utilise.

For more than a decade W3C WAI has worked on guidelines for authoring tools and user access agents. There has been little interest in these specifications in practice. Now, simply because of the demands of Web 2.0 and its evolution, we are seeing adherence to many of the principles in the guidelines. We expect to see even more in Web 3.0.

8. Implementing the Accessibility 3.0 Vision

Our speculations lead us to favour some practices over others. For this vision to be realised there is will be a need for adoption of the following principles:

1. Publication of resource components with persistent URIs and metadata descriptions in RDF (makes them accessible to the Semantic Web);
2. Accessibility metadata terms should be defined in published ontologies which can be shared and their relationships determined;
3. Web services should be provided for users who will tag resources with accessibility metadata;
4. Web services should be provided to support the development of alternative formats by users;
5. Web services should be developed to allow users to generate needs and preferences profiles and to change them;
6. Major resource suppliers should provide software that can match resources to individual user's accessibility needs and preferences;
7. Copyright laws should be changed to encourage, not complicate, the sharing of alternative formats of resources;
8. More people should publish their resources on the Web with Creative Commons licences so they can be shared.

These practices are not explained by the paper as our aim in this paper is to provide a context for thinking afresh about Accessibility 3.0. Our suggestions will need careful consideration and much discussion.

9. Learning From the Past

As suggested in the title of this paper the authors feel that when making place for the future we should learn from mistakes made in the past.

We have argued that a scalable approach to accessibility can be taken based on exploiting relationships between resources. But we need to remember that similar optimistic claims were made at the start of WAI's development of its Web accessibility 1.0 approach. What lessons should be learnt from the failures of the WAI approach to have the impact which was initially envisaged? The authors suggest the following lessons should be learnt and taken into account when seeking to develop alternative approaches:

- The need for market place acceptance of tools which implement our accessibility 3.0 vision;
- The dangers of seeking to standardise too soon;
- The dangers of embedding technological solutions in legislation too soon;
- The need to ensure that solutions scale to vast numbers of resources and users.

10. Conclusions

This paper has taken the ambitious steps of suggesting that rather than seeking to enhance the accessibility of individual Web resources ('accessibility 1.0') or support institutions in the development of holistic approaches to accessibility ('accessibility 2.0') we should be looking at the Web on a global scale ('accessibility 3.0'). This approach seeks to provide an inclusive Web which builds on the strengths of the Web communities which are forming the basis of many popular Web 2.0 social services complemented by emerging work taking place under the Semantic Web umbrella term. We hope that the reasons for the alternative approach described in the paper will be appreciated. We invite those who are involved in Web accessibility work to engage in discussions as to how a global inclusion Web can be developed.

References

1. DRC (2004). *The Web Access and Inclusion for Disabled People A formal investigation conducted by the Disability Rights Commission*. London: TSO ISBN 0 11 703287 5. Online at <http://www.drc.gov.uk/publicationsandreports/2.pdf>
2. ISO/IEC 24751-1 *Information technology -- Individualized adaptability and accessibility in e-learning, education and training -- Part 1: Framework and reference model (forthcoming)*.
3. ISO/IEC 24751-2 *Information technology -- Individualized adaptability and accessibility in e-learning, education and training -- Part 2: "Access for all" personal needs and preferences for digital delivery (forthcoming)*.
4. ISO/IEC 24751-3 *Information technology -- Individualized adaptability and accessibility in e-learning, education and training -- Part 3: "Access for all" digital resource description (forthcoming)*.
5. ISO/IEC CD 19788-1 *Information technology -- Learning, education and training --Metadata for learning resources -- Part 1: Framework (under development)*
6. Kelly, B., Sloan, D., Phipps, L., Petrie, H., & Hamilton, F. (2005). *Forcing standardization or accommodating diversity?: a framework for applying the WCAG in the real world* in Vol. 88 Proceedings of the 2005 International Cross-Disciplinary Workshop on Web Accessibility (W4A) Chiba, Japan, Pages: 46 - 54 ISBN:1-59593-219-4 ACM International Conference Proceeding Series; Publisher ACM Press New York. Online at http://portal.acm.org/ft_gateway.cfm?id=1061820&type=pdf&coll=GUIDE&dl=GUIDE&CFID=10797224&CFTOKEN=47740524
7. Kelly, B., Sloan, D., Heath, A., Petrie, H., Hamilton, F., & Phipps, L. (2006). *Contextual Web Accessibility - Maximizing the Benefit of Accessibility Guidelines" for "Building the Mobile Web: Rediscovering*

- Accessibility?* W4A 2006 workshop at the Fifteenth International World Wide Web Conference, in Edinburgh, Scotland, UK. Online at <http://www.w4a.info/2006/presentations/18-David-Sloan-et-al.pdf>
8. Kelly, B., & Brown, S. (2007). *Accessibility 2.0: A Holistic And User-Centred Approach To Web Accessibility* in Trant, J., & Bearman, D. (Eds) (2007). *Museums and the Web 2007: Proceedings*. Toronto: Archives & Museum Informatics. Online at <http://www.archimuse.com/mw2007/papers/kelly-brown/kelly-brown.html>
 9. Kelly, B., Nevile, L., Draffan, E., and Fanou, S. (2008). *One world, one web ... but great diversity*. In *Proceedings of the 2008 international Cross-Disciplinary Conference on Web Accessibility (W4a)* (Beijing, China, April 21 - 22, 2008). W4A '08, vol. 317. ACM, New York, NY, 141-147. DOI= <http://doi.acm.org/10.1145/1368044.1368078>
 10. Kelly, K. (2007a). *The Next 5000 days of the Web*. Talk posted on TED. Online at http://www.ted.com/index.php/speakers/kevin_kelly.html
 11. Kelly, K. (2007b). *Four Stages in the Internet of Things*. The Technium Online at http://www.kk.org/thetechnium/archives/2007/11/four_stages_in.php
 12. Nevile, L. (2005a). *Adaptability And Accessibility: A New Framework* in *Proceedings of OZCHI 2005*, Canberra, Australia. November 23 - 25, 2005. ACM (the Association for Computing Machinery) Digital Library. Online at <http://portal.acm.org/dl.cfm>
 13. Nevile, L. (2005b). *Anonymous Dublin Core Profiles for Accessible User Relationships with Resources and Services*, presented at DC 2005 Conference. Online at <http://purl.oclc.org/dcpapers/2005/paper09>. Later, republished as 2006 "Anonymous Dublin Core Profiles for Accessible User Relationships with Resources and Services" in *New Technology of Library and Information Service*, vol. 1/2006 Serial No.132, pp. 17-24.
 14. Oliver, M., (1990). *The individual and Social Models of Disability*. Paper presented at Joint Workshop of the Living Options Group and the Research Unit of the Royal College of Physicians on People with Established Locomotor Disabilities in Hospitals. Online at <http://www.leeds.ac.uk/disability-studies/archiveuk/Oliver/in%20soc%20dis.pdf>
 15. O'Reilly, T. (2005). *What Is Web 2.0?* Online at <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>
 16. Phipps, L., Witt, N. and McDermott, A. (2005). *To Logo or Not to Logo?* Online at http://www.techdis.ac.uk/index.php?p=3_8_8
 17. Treviranus, J. & Roberts, V. (2006). *Technology Assisted Inclusive Education* Ch 19 in Weiss, J., Nolan, J., & Trifonas, P. (Eds) *International Handbook of Virtual Learning Environments*. Editors: ISBN-10: 140203802X, ISBN-13: 978-1402038020 Kluwer Academic Publishers, Hamburg.
 18. Williams, M. (2008). *IBM software enhances Web accessibility for the blind* in *ITWorldCanada* Friday, July 11, 2008 Online at <http://www.itworldcanada.com/Pages/Docbase/ViewArticle.aspx?id=idgml-c71b4b16-f815-485f>