Univ Access Inf Soc (2010) 9:147–152
DOI 10.1007/s10209-009-0160-5

SHORT PAPER

What we know about dyslexia and Web accessibility: a research review

Jacob E. McCarthy · Sarah J. Swierenga

Published online: 22 September 2009

Abstract Compared to the online interaction behavior of other users, little is known about the difficulties dyslexic Web users encounter online. This paper reviews existing literature at the intersection of dyslexia and accessibility research to determine what useful knowledge exists regarding this important and relatively large group of users. This review uncovers that, although there are few published usability tests with dyslexic users, there is a considerable body of knowledge on dyslexia as well as many design guidelines for authoring dyslexic-accessible interfaces. Through a comparison of existing accessibility guidelines for dyslexic and non-dyslexic users and discussion of the plain language movement, it is argued that dyslexic-accessible practices may redress difficulties encountered by all Internet users. This conclusion suggests that usability testing yielding a clearer profile of the dyslexic user would further inform the practice of universal design, but also that enough knowledge is already available to allow doing more to increase accessibility for dyslexic Internet users.

Keywords Dyslexia · Accessibility · Disabilities · Usability · Interface design · Universal design

J. E. McCarthy (✉)
Michigan State University, 7 W Holmes Hall,
East Lansing, MI 48825, USA
e-mail: Mccar244@msu.edu

S. J. Swierenga
Michigan State University, 93 Kellogg Center,
East Lansing, MI 48824, USA

1 Introduction

The first diagnosis of dyslexia was made in 1887, but progress in the study of dyslexia was relatively slow until the educational reforms of the 1960s. Originally tackling the challenges presented to dyslexic readers by the printed page, researchers have recently begun examining the experiences of physically and, to a lesser extent, cognitively disabled Internet users. While few of these studies speak to the specific experiences of dyslexic Internet users, there is sufficient evidence to suggest that it is necessary to increase accessibility for lower-literacy users.

Dyslexia is more common than many realize. Prevalence is sometimes reported at 10%, but it has also been estimated that up to 17% of school-aged children in the U.S. experience dyslexia [1, 2]. An even greater number of people (up to 40%) possess some symptoms of dyslexia and are likely to benefit from inquiry into the dyslexic Internet users experience [2]. The effects of dyslexia are myriad and can include compromised self esteem and regard when the disability is highlighted [3]. There are laws requiring many Web sites to be accessible to those with disabilities and World Wide Web Consortium compliance is dependent on accessible Web sites [4]. Most designers understand that Web sites should be made accessible to all and that currently, further efforts are needed to extend access to disabled users [1, 5, 6]. Increasing accessibility of Web sites for people with dyslexia can also improve access for non-dyslexic users [7].

This paper seeks to uncover and explore what information about the dyslexic Internet user's experience is already available. The scope is tightly focused on Internet usability tests of dyslexic Internet users, but selected work in parallel areas is also considered that can offer insight into the experience of dyslexic Internet users.

By synthesizing existing research, it will be argued that while additional work aimed at developing a more complete profile of the dyslexic Internet user's experience is warranted, existing research is strong enough to help guide more accessible design practices for dyslexic users. Additionally, there is sufficient evidence to argue that attempts to increase accessibility for dyslexic users can, in fact, benefit non-learning disabled users as well.

2 Working definition of dyslexia

The term *dyslexia* is used to describe a specific learning disability. For the purposes of this review, dyslexia is defined according to the National Institute of Neurological Disorders and Stroke as "a brain-based type of learning disability that specifically impairs a person's ability to read…despite having normal intelligence" [8].

Worth noting is the fact that dyslexia may not affect learning in areas other than reading and writing and is often characterized by average intelligence. It is incorrect to pair dyslexia with attention deficit disorder or attention deficit hyperactivity disorder, as these disorders are behavioral in origin.

Dyslexia is sometimes described as a cognitive disability. In literature addressing accessibility of Web sites for people with cognitive disabilities, dyslexia is sometimes mentioned as one of the subject disabilities to be addressed [9–11] and sometimes not [12–14]. Because of the disparity in experience and ability of dyslexic readers and people with severe cognitive disabilities such as Downs Syndrome and Autism, this study of dyslexia and Internet accessibility will focus on literature devoted specifically to dyslexia rather than cognitive disabilities at large. It is believed this will yield a more specific and accurate discussion of the dyslexic Internet users' experience.

Dyslexia is believed to have serious impact on self perception and esteem in addition to reading skills, and sometimes cause behavioral problems [3].

3 State of research on dyslexia and accessibility

Several studies have looked at the experiences of Web users with cognitive disabilities. Small et al. [13] concluded that current Web guidelines do not meet the needs of cognitively disabled users and called for more research into how such disabilities affect Web site use. Anderson and Rowland [14] worked with learning disability stakeholders including educators, students and parents to develop a set of technical specifications for a suite of tools to evaluate the cognitive load of Web pages. There are numerous sets of recommendations for accessible Web design that take into account the experiences of dyslexic users [9, 12, 15–19]. Most of this work studies dyslexia only as one disability within the diverse group of cognitive disabilities.

Turning to research concerned specifically with dyslexia, the bulk focuses on the neurological sources of the disability [20–22], as well as education and the development of life skills [3, 23–25]. Education materials are concerned primarily with efforts by youth to decode text while life skills materials put the onus on the reader to adapt to a non-dyslexic society. None of these approaches are greatly concerned with issues of how people interact with computers or offer research-based findings for improving Web site accessibility for dyslexic users. As this review is interested in how to accommodate dyslexic Internet users of all ages, there are shortcomings in all of these approaches.

When turning to the field of Web site accessibility, the literature addresses the two primary concerns of accommodating physical disability and cognitive disability. These explorations sometimes include dyslexia, but rarely discuss dyslexia specifically or at length. Other studies address the use of technology assistance by disabled users, but these discussions skirt the issue of usability and accessibility, instead focusing on technology implementation [26, 27].

The fields of education and accessibility often overlap, producing broad documents like "Access all areas: disability, technology, and learning" [28]. Additionally, Beacham and Alty found that different computer-based media can affect dyslexic learners' performance, with dyslexics performing best with sound and diagram rather than textual materials [29].

Once the field of search is narrowed to the unique experience of dyslexic Web users, trends begin to emerge that suggest all users can benefit from dyslexia-friendly Web sites. Dixon's study of students' evaluations of a piece of education software found that dyslexic students identified more issues with greater specificity [30]. He writes that the symptoms of dyslexia are common to varying degrees among most people, suggesting a great fitness on the part of dyslexics for identifying usability problems. Usability testing of dyslexics is sparse, but a few tests have yielded results that support myriad lists of dyslexia-friendly Web style and other tools and resources aimed at extending accessibility to dyslexic users.

4 Usability tests of dyslexic users

There have been a handful of attempts to study Web site usability and accessibility among dyslexic readers.

In 2004, the UK's Digital Rights Commission undertook a task-oriented examination of 100 Web sites by 50 blind,

partially sighted, dyslexic, and physically and hearing impaired users [31]. Each user completed two tasks on ten Web sites. Dyslexic users experienced a 17% failure rate, which was lower than the rate experienced by blind and partially sighted users and higher than that experienced by physically and hearing impaired users. The key problems experienced by dyslexic users are common to most Internet users:

- Confusing page layout
- Unclear navigation
- Poor color selections
- Graphics and text too small
- Complicated language

Overall, the study found that just 19% of Web sites comply even with the lowest priority checkpoints for accessibility, and all categories of disabled users consider that site designs take insufficient account of their specific need.

Al-Wabil et al. [32] conducted interviews with ten dyslexic Web users and concluded that there are considerable barriers to Web use for dyslexics. This exploratory study revealed several patterns of behavior among the interviewees, including frustrations with both Web site structures and textual presentations. Responses to structural features such as navigation trails varied based on the severity of reading impairment, with less impaired users stating that navigation trails helped them understand where they were within a site, and moderately impaired users stating that navigation trails were helpful for backtracking, but not for keeping track of their location within a site. Other patterns surrounding use of search functions and back and forward browser buttons were also identified.

Kurniawan and Conroy [33] tested dyslexic and non-dyslexic students for reading comprehension speed and accuracy. Participants read materials of varying complexity and the authors concluded that dyslexic participants made increasingly frequent mistakes as reading material became more complex. This study also investigated the technological aids employed by dyslexic Internet users, such as screen readers and colored overlays, and found that allowing users to select their optimal color scheme increased reading speed for both dyslexic and non-dyslexic readers.

The DIAMONDS project was a study of ten Internet users' experiences with a piece of tutorial software [1]. The study was aimed at determining how best to move from accessibility awareness to practice. Of the ten users, nine were dyslexic and one was dyspraxic, having trouble executing fine motor tasks. The study used a combination of interviews, questionnaires, log sheets, and a focus group. Observation and talk-aloud protocol analysis were considered, but the software being tested required the students spend time at home working independently. Results indicated a desire among dyslexic students to customize the fonts, type size and colors of on-screen text. Due to the methodological objective of the study, full results of the usability test were not published.

In addition to the call for highly configurable text for dyslexic users, simplifying language and organization is also common. Jakob Nielsen [34] found that lower-literacy readers experience Web texts very differently than high literacy readers. The study cited the US Department of Education's National Adult Literacy Survey, which asserted that 48% of the U.S. population has low literacy, and Nielsen's estimate that 30% of Web users have low literacy. The study tested regular and low literacy optimized versions of a Web site with lower and higher literacy users. The three metrics included success percentage, task time and satisfaction. Recommendations for optimization included: prioritize information, avoid text that moves or changes, streamline the page design, simplify navigation, and optimize search. Nielsen found that the Web site optimized for low literacy readers resulted in improvements in all metrics: percentage, task time and satisfaction. The improvements for lower literacy readers also appeared to improve, rather than harm, the experience of high literacy users, as well.

Recently, Swierenga et al. [35] conducted a usability evaluation of the Michgan.gov voting Web site with users who have dyslexia. The usability evaluation of the voting information on the Michigan.gov Web site involved six participants who have dyslexia, specifically college students of voting age. Participants were asked to perform typical tasks such as locating voter registration requirements and ballot issues, and their activities were recorded (audio and videotaped). Participants were then asked to comment on their experience with the site and offer recommendations they believed would have made the site more usable. The results indicated several problems with the user interface for dyslexic users that the authors used to develop a list of recommended practices for more universal design.

These studies tell a great deal about dyslexia and accessibility. Many Web sites do not meet established accessibility standards, a situation that poses a significant barrier for many Internet users. It is believed that nearly one-third of Internet users are either dyslexic or possess some symptoms of dyslexia, and that the failure to address accessibility for dyslexics likely negatively affects their experience as users. Research-based recommendations are available for improving accessibility for dyslexics, such as allowing users to control the presentation of text. Perhaps most compelling, it is also well known that adjusting Web texts to make them more accessible to lower-literacy users also improves the experience of higher-literacy users as well.

5 How multimodal documents help dyslexic users

Research commonly notes that dyslexia is highly variable; there is no "typical" dyslexic Internet user. The results of Pollak's interviews with dyslexic college students underscore the potential strengths of multimodal documents for differently abled readers, rather than the "one document for all" approach [25]. Some researchers have addressed this idea, developing and testing highly configurable software.

SeeWord is a word processing software that allows users greater control over how information is displayed [36]. In response to an unpublished pilot study of dyslexic writers and computers that found there was no universal profile of dyslexics, SeeWord was designed to allow users to optimize writing and reading conditions in Microsoft Word for their own needs. The evaluation of SeeWord employed a "talk aloud" task-oriented observation, and concluded that some dyslexic users read more accurately when they are able to select their own text color and size settings.

Researchers have addressed readers' diverse abilities in other software development as well. The MultiReader system marks an attempt to create rich multimedia communications that are highly configurable for both user needs and preferences [6]. The project rejected the "one document for all" approach to accessibility, instead synchronizing multiple media types and affording the user more control over presentation. The project included an evaluation of the MultiReader system with 70 print-disabled users, and found that enabling greater control over presentation and synchronization of screen reader audio and text highlighting benefited dyslexic users. Petrie concludes by pointing out that adequate tools are in place for blind users, but that deaf and dyslexic users require more effort on the part of accessibility professionals.

6 Guidelines and resources

Despite the scarcity of research literature addressing Web accessibility for dyslexic users specifically, efforts to make more effective human–computer interactions for dyslexic and other disabled users are being made. Nielsen [34] recommends making text size selectable, using sans serif fonts, and using colors to visually designate important pieces of information. These measures are also recommended for dyslexic readers [2]. Many dyslexic Internet users employ screen readers for assistance, and so efforts to optimize Web sites for screen readers may benefit dyslexic users, even if the stated target audience is blind users [26].

A typeface has been developed specifically to address the recognition difficulties faced by dyslexic users. Dyslexic-friendly typefaces for digital environments have been limited due to the challenges of creating a highly pixilated sans serif that differentiates between similar letters such as "b" and "d". The Read Regular typeface more dramatically changes the profile of such letters and has been found to ease computer based reading for dyslexic users [37].

There are a host of recommendations aimed at developing Web sites friendly to dyslexic users.

- Pearson [38] outlines steps for designing online courses that include dyslexic readers.
- Rainger [16] synthesizes practitioners' experiences and usability research to illuminate the issues of accessibility and dyslexia.
- Bradford and Zarach [18, 39] offer style guidelines for making Web sites accessible to dyslexics.
- Jiwnani [17] makes recommendations for designing Web sites that are easier to read both by the cognitively disabled and the assistive technologies that the cognitively disabled often employ.
- Online tests can provide Web authors with immediate readability evaluations based on the Gunning Fog, Flesch-Kincaid and other reading level algorithms [40], but the accuracy of these tests has been questioned [28].
- Phipps et al. [28] offers guidelines for dyslexia friendly interfaces within the comprehensive TechDis book, "Access all areas: disability, technology, and learning".

Most of the guidelines listed above (and those employed by Nielsen in his study of low-literacy users) are also included in guidelines for improving access for people with other disabilities. In fact, Evett and Brown compared and drew contrast of overlap between recommendations for different disabilities [41]. That study, which concerned itself with the text and Web style guidelines for the Royal National Institute for the Blind and British Dyslexia Association, concluded that recommendations for blind readers closely parallel those for dyslexic readers. It also found that non-disabled users benefit greatly from adherence to accessibility guidelines aimed at blind, partially sighted, and dyslexic users.

7 Plain language/minimalism

The recommendations for designing dyslexia inclusive Web sites outlined above are not exclusive to the field of learning disability. As several studies already discussed have found, guidelines for dyslexia friendly Web sites can improve usability for non-dyslexic readers, too [30, 33, 34, 41]. Many of these guidelines are already accepted tenets of plain language, the movement for clear, concise, jargon-free texts. Plain language and accessibility have been linked in the past [7].

Originally a consumer response to legalese in business and government documents, several states have passed or

considered plain language laws [42]. The argument has been made that plain language is a vital part of Web accessibility and that its benefits are shared by disabled and non-disabled users alike [7]. This suggests that a study of dyslexia and Web accessibility could increase the accessibility of Web documents for all users, regardless of ability.

8 Conclusion

While great efforts have been made to research both dyslexia and Web accessibility, there is not a great body of work addressing both simultaneously. The majority of accessibility efforts are aimed at blind and visually impaired users or, to a lesser extent, users with severe cognitive disabilities. Within and adjacent to these studies, though, is a small but compelling body of work that, once uncovered, calls out clearly for increased attention to dyslexia and accessibility.

Meanwhile, evidence mounts that the Web sites that eschew guidelines for dyslexic accessibility not only undercut the esteem and successes of dyslexic users, but also their non-dyslexic counterparts. The high level of overlap in guidelines for dyslexia, other cognitive and physical disabilities, and plain language, suggest that dyslexic users could be a salient indicator group for overall Web accessibility. By undertaking more task-oriented usability research employing observation and talk-aloud protocols, a profile of the dyslexic Internet user's experience can be established. Such a profile would confirm or disconfirm the assumptions already commonly held, and strengthen the basis for accessibility initiatives that benefit users with and without dyslexia. Even without the confirmation of such additional studies, though, accumulated knowledge of dyslexia and accessibility offers tools to improve the dyslexic users experience and is sufficient to argue that access for dyslexic users is in fact a matter of access for everyone.

References

1. Craven, J., Booth, H.: Putting awareness into practice: practical steps for conducting usability tests. Libr. Rev. **55**(3), 179–194 (2006)
2. Shaywitz, S.E., Shaywitz, B.A.: The neurobiology of reading and dyslexia. National center for the study of adult learning and literacy. Focus Basics **5**(A), 11–15 (2001)
3. Reid, G., Kirk, J.: Dyslexia in Adults: Education and Employment. Wiley, New York (2001)
4. Williams, P., Nichols, D.: Testing the usability of information technology applications with learners with special educational needs. J. Res. Spec. Educ. Needs **6**(1), 31–41 (2006)
5. Harryson, B., Svensk, A., Johansson, G.: How people with developmental disabilities navigate the Internet. Br. J. Spec. Educ. **31**(3), 138–142 (2004)
6. Petrie, H., Weber, G., Fisher, W.: Personalization, interaction, and navigation in rich multimedia documents for print-disabled users. IBM Syst. J. **44**(3), 629–635 (2005)
7. Boldyreff, C., Burd, E., Donkin, J.: The case for the use of plain English to increase Web accessibility. In: Proceedings of the 3rd International Workshop on Web Site Evolution, Florence, Italy (2001)
8. NINDS Dyslexia Information Page: National Institute of Neurological Disorders and Stroke. http://www.ninds.nih.gov/disorders/dyslexia/dyslexia.htm. Accessed 29 Sept 2008
9. Kolatch, E.: Designing for users with cognitive disabilities. In: The Universal Usability Guide, University of Maryland, College Park. http://www.otal.umd.edu/UUGuide/erica (2000). Accessed 29 Sept 2008
10. Seeman, L.: Inclusion of cognitive disabilities in the Web accessibility movement. In: Proceedings of The 11th International World Wide Web Conference, Honolulu, HI (2002)
11. Francik, E.: Telecommunications problems and design strategies for people with cognitive disabilities: annotated bibliography and research recommendations. In: Rehabilitation Engineering Research Center on Universal Telecommunication Access. http://www.wid.org/publications/downloads/telecom_design_strategies.pdf (1999). Accessed 29 Sept 2008
12. Bohman, P.: Cognitive disabilities part 1: we still know too little and we do even less. In: Webaim. http://www.Webaim.org/articles/cognitive/cognitive_too_little/ (2004). Accessed 29 Sept 2008
13. Small, J., Schallau, P., Brown, K., Appleyard, R.: Web accessibility for people with cognitive disabilities. In: Proceedings of the CHI 2005 Conference, Portland, USA, pp. 1793–1796
14. Andersen, A., Rowland, C.: Improving the outcomes of students with cognitive and learning disabilities: phase I development for a Web accessibility tool. In: Proceedings of the 9th International ACM SIGACCESS Conference on Computers and Accessibility, Tempe, Arizona, USA, pp. 221–222 (2007)
15. Hudson, R., Weakly, R., Firminger, P.: An accessibility frontier: cognitive disabilities and learning difficulties. In: Web Usability. http://www.usability.com.au/resources/cognitive.cfm (2004). Accessed 29 Sept 2008
16. Rainger, P.: A dyslexic perspective on e-content accessibility. In: JISC TechDis. http://www.techdis.ac.uk/seven/papers/dyslexia.html (2003). Accessed 29 Sept 2008
17. Jiwnani, K.: Designing for users with cognitive disabilities. In: Universal Usability in Practice, University of Maryland, College Park. http://www.otal.umd.edu/uupractice/cognition/ (2001). Accessed 29 Sept 2008
18. Bradford, J.: Designing Web pages for dyslexic users. In: Dyslexia Online Magazine. http://www.dyslexia-parent.com/mag35.html (2005). Accessed 29 Sept 2007
19. Caldwell, B., Chisholm, W., Slatin, J., Vanderheiden, G. (eds.): Understanding WCAG 2.0 W3C Working Draft 27 April 2006. W3C World Wide Web Consortium. http://www.w3.org/TR/UNDERSTANDING-WCAG20/. Accessed 17 Mar 2008
20. Bruck, M.: Persistence of dyslexics' phonological awareness deficits. Dev. Psychol. **28**, 874–886 (1992)
21. Shaywitz, S.E., Shaywitz, B.A., Pugh, K.R., Fulbright, R.K., Constable, R.T., Mencl, W.E., Shankweiler, D.P., Liberman, A.M., Skudlarski, P., Fletcher, J.M., Katz, L., Marchione, K.E., Lacadie, C., Gatenby, C., Gore, J.C.: Functional disruption in the organization of the brain for reading dyslexia. Proc. Natl. Acad. Sci. **95**(5), 2636–2649 (1998)
22. Rumsey, J.M., Nace, K., Donohue, B., Wise, D., Maisog, J.M., Andreason, P.: A positron emission tomographic study of

impaired word recognition and phonological processing in dyslexic men. Arch. Neurol. **54**, 562–573 (1997)
23. Fletcher, J.M., Shaywitz, S.E., Shankweiler, D.P., Katz, L., Liberman, I.Y., Stuebing, K.K., Francis, D.J., Fowler, A.E., Shaywitz, B.A.: Cognitive profiles of reading disability: comparisons of discrepancy and low achievement definitions. J. Educ. Psychol. **86**, 6–23 (1994)
24. Hamm, M.W., Seidenberg, M.S.: Phonology, reading acquisition, and dyslexia: Insights from connectionist models. Psychol. Rev. **106**(3), 491–528 (1999)
25. Pollak, D.: Dyslexia, the Self and Higher Education. Trentham Books, Sterling (2001)
26. Elkind J (1998) Computer reading machines for poor readers. Perspect. Int. Dyslexia Assoc. **24**(2), 9–14
27. Deibel, K.: Understanding and supporting the use of accommodating technologies by adult learners with reading disabilities. Access. Comp. **86**, 32–35 (2006)
28. Phipps, L., Sutherland, A., Seale, J. (eds.): Access all areas: disability, technology and learning. In: JISC TechDis. http://www.techdis.ac.uk/resources/files/AAA.pdf (2002). Accessed 29 Sept 2008
29. Beacham, N.A., Alty, J.L.: An investigation into the effects that digital media can have on the learning outcomes of individuals who have dyslexia. Comp. Educ. **47**, 74–93 (2006)
30. Dixon, M.: Comparative study of disabled vs. non-disabled evaluators in user-testing: dyslexia and first year students learning computer programming. In: Stephanidis, C. (ed.) Universal Access in Human Computer Interaction. Coping with Diversity. Lecture Notes in Computer Science, vol. 4554, pp. 647–656. Springer, Berlin (2007)
31. Disability Rights Commission (DRC): The Web: Access and Inclusion for Disabled people. A formal Investigation conducted by the Disability Rights Commission. DRC, London (2004)
32. Al-Wabil, A., Zaphiris, P., Wilson, S.: Web navigation for individuals with dyslexia: an exploratory study. In: Stephanidis, C. (ed.) Universal Access in Human Computer Interaction. Coping with Diversity. Lecture Notes in Computer Science, vol. 4554, pp. 593–602. Springer, Berlin (2007)
33. Kurniawan, S., Conroy, G.V.: Comparing comprehension speeds and accuracy of online information in students with and without dyslexia. In: Kuriawan, S., Zaphiris, P. (eds.) Advances in Universal Web Design and Evaluation, pp. 271–292. Idea Group, Hersey (2007)
34. Nielsen, J.: Lower-literacy users. In: Jakob Nielsen's Alertbox. http://www.useit.com/alertbox/20050314.html (2005). Accessed 29 Sept 2008
35. Swierenga, S.J., Porter, J.E., Ghosh, S., McCarthy, J.E.: Dyslexia and Website Design: The Importance of User-based Testing. Fourth International Congress of Qualitative Inquiry, Urbana-Champaign, IL, 16 May (2008)
36. Gregor, P., Dickinson, A., Macaffer, A., Andreasen, P.: SeeWord—a personal word processing environment for dyslexic computer users. Br. J. Educ. Tech. **34**(3), 341–355 (2003)
37. Asaravala, A.: New typeface to help dyslexics. In: Wired News. http://www.wired.com/science/discoveries/news/2003/10/60834 (2004). Accessed 29 Sept 2008
38. Pearson, E., Koppi, T.: Essential elements in the design and development of inclusive online courses. Int. J. E-Learn. **2**(4), 52–59 (2003)
39. Zarach, V.: Ten Guidelines for Improving Accessibility for People with Dyslexia. CETIS University of Wales Bangor. http://www.cetis.ac.uk/members/accessibility/links/disabilities/documents/dyslexia (2002). Accessed 2 April 2007
40. Readability test: Juicy Studio. http://juicystudio.com/services/readability.php (2007). Accessed 29 Sept 2008
41. Evett, L., Brown, D.: Text formats and Web design for visually impaired and dyslexic readers—clear text for all. Interact. Comp. **17**(4), 453–472 (2005)
42. Crawford, A.: State targets bureaucratese to improve communication. In: Arizona Republic, 6 Jan (2008)