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Digital Divide - Background Materials [1]

Stack:

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Row:

112

Section:

1

Shelf:

5

Position:

3

Dear Tom, Jon:

Per request, here are my thoughts regarding the digital divide trip. Some of these are echoes of things we discussed at the meeting. Others are extensions. I put them here together for continuity.

If I were looking for an integrated theme,

I would look at "government – private sector partnership." where

Government invests in developing solutions; the private sector invests in incorporating the solutions into their practice

The reason for this division is as follows.

Government Role

Industry really has trouble in paying for basic research. It doesn't fit their standard motivation factors and is something that needs to be done in concentrated fashion rather than being scattered across all of the different companies, each doing it in a private fashion. Also, doing research which is shared openly with competitors is not the normal model for industry. This is especially true of this work, since many of the techniques for making products more accessible also make them more usable for their core customers. Thus sharing these ideas with competition (except by them seeing an already shipping product) is usually not allowed. Thus carrying out research to develop new solution strategies is best done in universities or other public research institutions with government funding. (An interesting thing to look at here might be getting industry to provide matching funds to the government funding for research in this area. This would allow a cost sharing, but would still use the government-funded public research model.

Industry Role

On the other hand, government can do nothing about actually causing accessible products to be in the marketplace directly. Only industry can create more accessible products so that people with disabilities do not fall into the digital divide. The major contribution to be looking for from industry would be, therefore, having them build accessibility into their products and systems. This means:

- Following the web accessibility guidelines in their public internet sites (and intranet sites, so that people with disabilities can operate within the corporation); and
- Building accessibility into their standard products (not just one or two, but designing all of their products to be as cross-disability accessible and accessible to people who are older as is commercially possible).

Government Facilitation

The government can facilitate this latter process through activities such as Section 255

(Telecom Act) and Section 508 (Rehab Act). You might pitch that as: “the government intends to provide incentives and rewards to companies that make their products accessible by diligently enforcing Section 508 so that those companies who make their information and communication technologies accessible to people with disabilities will have a competitive edge in sales to the Federal government.” I think pitching 508 as being a reward to those companies that make their products accessible is a nice way to incorporate 508 into this picture in a positive way, while at the same time making sure that 508 is mentioned, since it is probably the single most important thing the government can do to help close the digital divide for people with disabilities.

Specifics

Given these three themes:

1. Government working with industry to help develop new and better solutions;
1. Industry investing in creating more accessible/usable web, information, and telecommunication technologies; and
2. Government encouraging accessible electronic and information technologies through preferential buying via Section 508.

You can then follow up with specific points in each. In fact, you could change #3 to read “Government providing incentives and rewards for creating accessible standard information technology products.” You can perhaps think of some other things that would go under that as well.

My thoughts for the three items at this point are:

1. Government and industry investing in developing solutions.

- Announcement of formalization of the universal design initiative in NSF from a project status into a program status.
- Increased funding for that initiative.
- Funding initiatives in NSF or NIDRR or other agencies targeted at creating examples and disseminating information about more accessible electronics, telecommunication, and information technologies (see the 508 working group for ideas).
- Any announcements of industry matching funds for government work in this area.
- Making accessibility a key component of other government initiatives (require accessibility / usability (by people with disabilities) impact

statement for major technology initiatives (just requiring that people launching technology initiatives write up a disability impact statement would be sufficient to put this topic on their radar screen and bring issues to their attention, which can be very powerful).

- Any industry announcements of funding of research.

2. Private Investment in Using the Solutions

- Any commitments by the private sector to follow the web accessibility guidelines.
- Any commitments by industry to build accessibility into their products (especially companies committing to build accessibility across their products, and not just into specific items).

1. Government Encouragement

- Preferential buying of more accessible information technologies, etc. through vigorous enforcement of Section 508 (or perhaps just “through enforcement of 508”).
- Recognition of exemplary practices at events such as this.

Other Notes and Observations

REWARD RESULTS, NOT PROCESS - In looking at #2, I’m tempted to look sometimes at things like the following -- :

Process ideas (WHICH I DO NOT RECOMMEND FOCUSING ON)

- Increasing the use of people with disabilities in testing their products;
- Involving people with disabilities in the early concept stages;
- Providing support to third party assistive technology vendors to make their products accessible.

All of these are “process” steps rather than results steps. I’ve found that it’s a lot easier for companies to do these things than to actually create accessible products. Also, these steps are things that need to be done in order to create accessible products, but they are nowhere near sufficient. Therefore, I would tend to stay away from rewarding people for doing these kinds of things, *and instead just reward and recognize them for developing*

accessible products. If their products come out and are accessible, it doesn't matter what the process was. Similarly, if the products are NOT accessible, it doesn't really matter how many of these other steps they committed to or did. Obviously, they were not effective or sufficient.

I would, therefore, try to avoid commitments toward process and instead focus on commitments to creating more accessible products, and especially to trying to build access features into their main line products. Of greatest interest are commitments to build accessibility into their products across the board.

CAPACITY BUILDING – In step 1 above, which talks about the government investing in developing solutions, you might want to talk about the government investing in solutions and capacity building. You could also break that into two, but I think you don't want to have a four-step program or something. It's just too much for people to keep track of, although this is your realm and you understand this much better than I. Capacity building, though, is one of our biggest problems. We don't have nearly enough people who really know what they're talking about in this area to meet the demand. In the past, there hasn't been that much of a demand. If the White House efforts and Section 508 succeed, however, then we're suddenly going to be really short of people who know what they're talking about. The government is already announcing several RFPs over the next period of time to help build capacity, train people, and provide technical assistance in the area of more accessible information technologies. I think that it would be something you might want to capitalize and raise in this area. It could fit in as part of #1, or it could be another item that immediately follows it (if you did a four-step program).

RETURN TO ACHIEVING WEB SITE ACCESSIBILITY IN STATE GOVERNMENT

UNDERSTANDING THE DIGITAL ECONOMY Data, Tools and Research

May 25 and 26, 1999
US Department of Commerce
Washington DC

THE GROWING DIGITAL DIVIDE IN ACCESS FOR PEOPLE WITH DISABILITIES:

OVERCOMING BARRIERS TO PARTICIPATION

by

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The Growing Digital Divide in Access for People with Disabilities: Overcoming Barriers to Participation in the Digital Economy

By Cynthia D. Waddell, JD

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I. Introduction

This White Paper was commissioned by the National Science Foundation to be presented on May 25, 1999 at the "Understanding the Digital Economy" conference; a public conference convened in response to a directive from the President of the United States to the National Economic Council, in consultation with executive branch agencies.[1]

The conference is timely because there are significant law and policy issues impacting the community of people with disabilities in their ability to overcome digital barriers and participate in the digital economy. The growth and success of the emerging digital economy requires that attention be paid to the mechanism for enabling dynamic participation. Unless the civil rights of America's 54 million[2] people with disabilities are addressed during this period of rapid, technological development, the community will be locked out from participation on the basis of disability and the technological world will not be enriched by their diverse contributions.

The impact is systemic and reaches all sectors of our economy, whether or not the

participant is a consumer, business owner, employee, educator, student, parent, child or citizen. Specific digital economy barriers need to be addressed in our research in order to inform our civil rights laws and public policy. As a person with a disability responsible for local government compliance with state and federal disability rights law, the author joins stakeholders in seeking a smart process that engages both individual differences and the collective community.[3]

This paper identifies some of the emerging digital economy barriers, current efforts to address these barriers and expresses the author's vision of the long-term policy research agenda. Because the benefits for overcoming these barriers extend beyond the community of people with disabilities, there are practical and significant business reasons for addressing this issue. Rather than creating a growing digital divide, emerging technology can enable full participation in the digital economy for everyone, regardless of age, disability or the limitations of the technology available.[4]

II. Multiple Methods for Access Benefit Everyone

As we examine the civil rights requirements for access and fairness, note the additional benefits that accrue: by mainstreaming the functionality found in the assistive computer arena into the architecture of our digital economy, we will expand technological innovations and develop creative solutions. By embracing our individual differences, the collective community receives greater benefits than that achieved through the segregation and isolation of people with disabilities.

Because the digital economy by definition requires a dynamic Internet environment, the very functionality required by the disability community can satisfy this dynamic requirement for web-based transactions. Accessible web design enables dynamic web sites- whether or not it is for business transactions, voting or long-distance learning. In addition, many benefits are emerging in the application of accessible web design. Accessible web design enables CD and videotapes to be archived through captioning. Accessible web design also enables electronic textbooks to be accessible. Even illiterate populations can access the Internet by listening to screenreaders audibly reading the web.

And lastly, web accessibility enables low technology to access high technology. People with slow modems and low bandwidth can access the electronic content of the web. Even consumers without state of the art computer equipment or who only have a telephone, can participate in an accessible Internet environment using a telephone browser.

As Susan Brummel Turnbull pointed out in her white paper, "People with Disabilities and the NII: Breaking Down Barriers, Building Choice,[5] the public interest for investing in the National Information Infrastructure (NII) and people with disabilities is that it:

- Removes communications and information access barriers that restrict business and social interactions between people with and without disabilities
- Removes age-related barriers to participation in society
- Reduces language and literacy-related barriers to society
- Reduces risk of information worker injuries and

- Enhances global commerce opportunities.

III. Emerging Barriers in Web Page Transactions and the Internet Environment: The Problem

The more the marketplace is transformed into a digital economy, the more obvious it is to the community of people with disabilities that they cannot participate due to inaccessible web design.[6] It is true that on a case by case basis computer stations with assistive computer technology can be tailored to the particular needs of people with disabilities. But we have not fully addressed the linkage of the individual with the Internet community as a whole. Rapid changes in the Internet environment require that we examine not only the end-user workstation needs but also the technology barriers emerging beyond the computer workstation. End-users utilizing assistive computer technology cannot conduct web transactions if the Internet environment does not accommodate the functionality needs of accessible design. Unless this problem is addressed, expenditures on infrastructure and technology accommodations will be wasted if attention is not paid to the end-user locked out of the Internet due to inaccessible design.

According to the National Council on Disability[7], computers and the Internet are used by a significant number of people with disabilities in America.[8] But because the Internet environment is inaccessible, it is difficult to count the number of people with disabilities who would like to participate but cannot because of the barriers to access. Counting users on the Internet is like counting the number of people using wheelchairs who are inside an inaccessible building. It was once thought that since no wheelchair users were in the building, ramps were not needed.

The transformation of the Internet from a text-based medium to a robust multi-media environment has created a crisis – a growing digital divide in access for people with disabilities. Previously, people with visual disabilities were able to access the Internet with their screen readers audibly reading aloud the text on a web page. Today, graphical web pages are a barrier if they do not incorporate accessible web design.

This barrier is systemic and must be addressed in our policies as well as in our education and outreach. In their practical guide to the information economy for executives and policymakers, *Information Rules: A Strategic Guide to the Network Economy*, authors Shapiro and Varian point out that “[t]oday more than 60 percent of Internet traffic is to Web Sites, and of the Web traffic, almost three-fourths is images.”[9]

The problem for screen readers is that inaccessible web page design either hides the text within images, frames, applets or animated gifs or renders the text unintelligently in table, columnar, or portable document format (pdf). Even on-line forms are inaccessible especially when designed to prevent keyboard navigation and input. Whether the form is posted for school or event registration or on-line banking or shopping transactions, people with visual and/or mobility disabilities are faced with a significant barrier to participation.

But the impact is not limited to people with visual and mobility disabilities. People with

specific learning disabilities are also finding that they can no longer access web pages audibly with screen readers. Even people with cognitive disabilities are becoming lost due to the absence of navigation elements at web sites. Moreover, people with hearing disabilities cannot access the content of audiostreaming and videoclips posted on the Internet due to the absence of captioning.

The digital divide in web page transactions and the Internet environment has bred a host of additional problems for people with disabilities. For example, commercial web-authoring applications lack access tool kits for webmasters to correct accessible web design problems. In fact, many current web-authoring tools on the market make it extremely difficult to even design an accessible web page. The scarcity of tools also contributes to the lack of education among programmers and web authors on why and how to code an accessible web page. And if the webmaster herself is a person with a disability, she will also find a lack of web authoring applications that she can utilize. This is especially true for webmasters with mobility disabilities requiring voice, eye tracking or keyboard input/output features in web authoring applications.

Whether the digital barrier is the inaccessible design of Internet/Intranet web sites, Internet Service Provider "portals," incompatible browsers, or inaccessible web-based platforms for on-line business, the trend is growing and must be addressed at the infancy of the digital economy. Already, exciting electronic and information technology features are emerging in the areas of information appliances, real-time conference participation, audio-streaming, telephone voice browsers, search engines, news groups, chat rooms and 3-D imaging. Unless functionality solutions for accessibility are addressed today, the state of the digital divide tomorrow may be impossible to overcome.

IV. Disability Rights Law and Policy Impacting Web Page Transactions and the Internet Environment

Consider the comments of Lawrence Lessig in his article on "Cyber-Governance":

We have no problem of governance in cyberspace. We have a problem with governance. There isn't a special set of dilemmas that cyberspace will present; there are just the familiar dilemmas that modern governance confronts- familiar problems in a new place Cyberspace is that space constituted by code- by software and hardware that together make up the architectures that cyberspace is These architectures are many; the values that they imbed- privacy, anonymity, access, control- are varied; and hence a choice about these architectures is a choice about these values. Yet we are at a time when we are strangely disabled from making choices about these architectures.[10]

If it is true that we are disabled from making smart choices about cyberspace architectures, then inaccessible web design is certainly evidence of this problem. Yet, the evolution of our disability rights laws have resulted in the understanding that access to information and communication is a civil right for people with disabilities. Some of the current federal statutes and their implementing regulations that protect this civil right include:

1. Section 504 of the Rehabilitation Act of 1973[11]
2. Section 508 of the Rehabilitation Act of 1973[12]
3. Rehabilitation Act Amendments of 1986[13]
4. Technology-Related Assistance for Individuals with Disabilities Act of 1988 (Tech Act)[14]
5. Americans with Disabilities Act of 1990 (ADA)[15]
6. Education of the Handicapped Act Amendments of 1990[16]
7. Education for All Handicapped Children Act of 1975 (EAHCA)[17]
8. Handicapped Infants and Toddlers Act[18]
9. Telecommunications Act of 1996[19]
10. Section 121 of the U.S. Copyright Law[20]
11. Individuals with Disabilities Education Act[21]

Although each of these statutes, their amendments and regulations deserve an extended discussion as to the civil right protections impacting electronic and information technology, this paper is limited to highlighting some of the significant legal issues that can inform our policy impacting people with disabilities.

ADA Legal Challenges

First, as of this writing there have been no legal challenges under the Americans with Disabilities Act of 1990 (ADA) on the issue of inaccessible web pages and the Internet environment. Nevertheless, attention is being paid to the application of the ADA to inaccessible web design because of the scope and impact of this statute protecting people with disabilities from discrimination in their access to employment and commerce.

As discussed below, the ADA requirements for “effective communication” and the provision of “auxiliary aids and services” and “reasonable accommodations” apply to the computer and Internet environment. Because of the ongoing duty to remove barriers, it is not enough to respond on an ad-hoc basis to individual requests for accommodation. There is an affirmative duty to develop a comprehensive policy involving input from the community of people with disabilities. New technology must either improve accessibility or ensure compatibility with existing access design functions. In addition, the ADA also provides for a “new generation of civil rights laws in which Congress assigned Federal agencies not only the duty to enforce, but also to inform all parties (persons with disabilities and covered entities) of their responsibilities and rights under the law.”[22]

Nevertheless, as discussed in this author’s article “Applying the ADA to the Internet: A Web Accessibility Standard,”[23] the U.S. Department of Justice (USDOJ) has issued only one policy ruling letter concerning web site accessibility dated September 9, 1996 (hereinafter USDOJ Letter).[24] In fact, the USDOJ has been faulted for failing to provide proactive guidance on web site accessibility.[25] But the USDOJ Letter does reiterate the ADA requirement that covered entities must furnish appropriate auxiliary aids and services where necessary to ensure effective communication with individuals with disabilities, unless doing

so would result in a fundamental alteration to the program or service or in an undue burden.[26]

Under the rationale of “effective communication,” the USDOJ Letter states that ADA Titles II and III require state and local governments and the business sector to provide effective communication whenever they communicate through the Internet. The effective communication rule applies to covered entities using the Internet for communication regarding their programs, goods or services since they must be prepared to offer those communications via an accessible medium.

Specifically addressing the needs of people with visual disabilities, the USDOJ Letter points out that providing a text format rather than a graphical format assures accessibility to the Internet for individuals using screenreaders. Without special coding a text browser will only display the word “image” when it reads a graphic image. Moreover, if the graphic is essential to navigating the site (such as a navigational button or arrow) or if it imparts vital information (such as a table or image map) the user can get stuck and not be able to move or understand the information provided.

Legal challenges are anticipated[27] amid the growing avalanche of ADA administrative complaint filings that have yet to reach the courts. In fact, a number of web site complaints have quietly settled with the covered entities promising to retrofit their web sites for accessible design. Examples of the types of ADA complaints anticipated include: employees requiring accessible intranet/internet environment as a reasonable accommodation under ADA Title I; employees and students requiring access to long-distance learning courses; citizens requiring access to internet kiosks for voting or participating in business or governmental transactions; or consumers requiring access to electronic textbooks and the web-based environment.

Emerging Legal Requirements for Internet Accessibility

Section 508: Electronic and Information Technology

The newly revised Section 508 of the Rehabilitation Act of 1973[28] now imposes strict accessibility requirements for electronic and information technology developed, maintained, procured, or used by federal agencies. As part of the Section 508 implementation effort, on April 2, 1999 Attorney General Janet Reno directed that all federal agencies conduct self-evaluations of their electronic and information technology and report by June 15, 1999 the extent to which their electronic and information technology is accessible to people with disabilities.[29] This Section 508 compliance package includes a number of accessibility checklists for software, web page, information technology machines, (ITM) and information technology (IT) equipment as well as a Resource Guide.[30]

The definition of electronic and information technology under Section 508 includes:

computers, hardware, software, web pages, facsimile machines, copiers, telephones and other equipment used for transmitting, receiving, using or storing information.[31] It is expected that by February 7, 2000 the Architectural and Transportation Barriers Compliance Board (Access Board) will issue standards that will define what is meant by electronic and information technology and will set forth the technical and functional performance criteria for accessibility implementation.[32]

U.S. Department of Education, Office for Civil Rights

Lastly, for the last four years there have been significant legal developments coming out of the U.S. Department of Education, Office for Civil Rights, in their OCR Letters of Resolution against higher education institutions in the State of California.

Access to the learning environment is a critical, front-line issue requiring an immediate resolution. For example, library reference services are being transformed by the efficiency of Internet access to information systems and search engines. Professors are teaching long-distance learning courses over the Internet and even if a student is physically in class, homework assignments and resources are being posted on classroom web pages. Yet, even if a library terminal has assistive computer technology installed for students or visitors with disabilities, Internet research is not possible with inaccessible web page design.

The following is a summary of four selected California OCR Letters of Resolution impacting Internet accessibility:

1. OCR Letter Docket No. 09-95-2206 (January 25, 1996): Student complaint that a university failed to provide equivalent access to the Internet. Student with a visual disability was required to make appointments with personal reader attendants as the exclusive mechanism for access to the Internet. The University also failed to complete the "Self-Evaluation Plan" as required by ADA Title II. According to the finding:

The issue is not whether the student with the disability is merely provided access, but the issue is rather the extent to which the communication is actually as effective as that provided to others. Title II [of the ADA] also strongly affirms the important role that computer technology is expected to play as an auxiliary aid by which communication is made effective for persons with disabilities. OCR notes that the "information superhighway" is fast becoming a fundamental tool in post-secondary research.[33]

2. OCR Letter Docket No. 09-97-2002 (April 7, 1997): Student complaint that a university failed to provide access to library resources, campus publications, open computer laboratories, training on adaptive computer technology and computer test-taking. According to the finding:

Title II of the Americans with Disabilities Act (Title II) requires a public college to take appropriate steps to ensure that communications with persons with disabilities

“are as effective as communications with others” [28 C.F.R. § 35.160(a)]. OCR has repeatedly held that the term “communication” in this context means the transfer of information, including (but not limited to) the verbal presentation of a lecturer, the printed text of a book, and the resources of the Internet. Title II further states that, in determining what type of auxiliary aid and service is necessary, a public college shall give primary consideration to the requests of the individual with a disability [28 C.F.R. § 35.160(b)(2)].[34]

In further clarifying what is meant by “effective communication,” OCR held that the three basic components of effective communication are: “timeliness of delivery, accuracy of the translation, and provision in a manner and medium appropriate to the significance of the message and the abilities of the individual with the disability.”[35]

OCR also points out that the courts have held that a public entity violates its obligations under the ADA when it only responds on an ad-hoc basis to individual requests for accommodation. There is an affirmative duty to develop a comprehensive policy in advance of any request for auxiliary aids or services. See *Tyler v. City of Manhattan*, 857 F. Supp. 800 (D.Kan. 1994)[36] Moreover, according to OCR “[a] recognized good practice in establishing such a comprehensive policy is to consult with the disability community, especially those members most likely to request accommodations.”[37]

Of particular interest is the analogy OCR draws between the rationale for bringing an existing building up to code for access and the purchase of new technology for information systems. For example, buildings built prior to access laws are governed by “program access” requirements and remodeling triggers the requirement to install certain accessible architectural features.

Similarly, the effective communication requirement according to OCR imposes a duty to solve barriers to information access that the entity’s purchasing choices create. Whenever existing technology is “upgraded” by a new technology feature, it is important to ensure that the new technology either improves accessibility or is compatible with existing assistive computer technology.[38] For example, web-authoring software programs that erect barriers in their coding of web pages fall under this scrutiny.

Lastly, OCR states that when an entity selects software programs and/or hardware equipment not adaptable for people with disabilities, “the subsequent substantial expense of providing access is not generally regarded as an undue burden when such cost could have been significantly reduced by considering the issue of accessibility at the time of the initial selection.”[39] Therefore all technology improvements must take into account the removal of barriers and ensure that new barriers to access do not occur. Covered entities preparing to retrofit their web sites need to be aware of this requirement.

3. OCR Letter Docket No. 09-97-6001 (January 22, 1998): OCR Statewide compliance review under Title II of the ADA and Section 504 of the Rehabilitation Act. The purpose of the review and subsequent OCR Report was to assess how 106 California Community Colleges meet their obligations to students with visual disabilities in providing

access to print and electronic information. In OCR's letter dated January 22, 1998,[40] the comprehensive review suggested nine strategies to address:

- Cost-effective approach to purchasing adaptive technology
- Adaptive technology training
- Access guidelines for distance learning and campus web pages as well as tools for training faculty and staff
- Inclusive language in the distribution of standard technology grants/funds addressing college responsibility to ensure technology access and compatible upgrades
- Print materials translated into alternate formats such as electronic text and Braille
- Central registry of textbooks in alternative formats
- Library technology initiatives for access to both students and patrons with disabilities
- Follow-up to OCR survey initiated in 9/18/96 to determine compliance progress
- Annual reviews of Disabled Student Programs and Services to include attention to the removal of barriers in electronic technology

The Community College Chancellor has agreed to implement OCR's recommendations to help the colleges meet their obligations under the ADA and Section 504 of the Rehabilitation Act.[41] Whereas the assistive computer technology training, support and services for students with disabilities was once limited to staff exclusively working with the Office of Disabled Student Programs, a systemic plan is now required for mainstreaming this knowledge campus-wide:

"Technology access, like architectural access, must be addressed institutionally as an integral part of the planning process." [42]

Just as the removal of architectural barriers requires a plan for implementation, the removal of technological or digital barriers in programs and services requires a comprehensive institutional plan impacting every campus office.

4. OCR Letter Docket No. 09-99-2041 (April 20, 1999): Student complaint that the university failed to provide access to the College of Business curriculum and other educational programs, including computer laboratories and classes in the College of Business. OCR noted that although the academic community has heavily relied upon centralized units on campus to house and maintain assistive computer technology:

[S]uch sole reliance upon a single centralized location (when not limited to adaptive technology training, but instead used for instructing disabled students in course subject matter) may run counter to the strong philosophy embodied in Title II and Section 504 regarding the importance of fully integrating students with disabilities into the mainstream educational program, unless such services cannot be otherwise effectively provided [see 34 C.F.R. § 104.4(b)(iv); 28 C.F.R. § 35.130(b)(iv)] . Thus, OCR assumes in most cases computer access will be effectively provided to the student with the disability in an educational setting with his or her nondisabled peers and classmates at the various computer laboratory sites scattered throughout the

campus.[43]

As a result, the mainstreaming of students with disabilities has created the need for appropriate technology tools for access to the learning environment. And as students with disabilities move into the workforce as employees, employers or consumers, accessible web design and an accessible internet platform remains a significant issue to be addressed in the digital economy. In other words, overcoming barriers in the digital economy requires appropriate policies, technology tools and education for accessible system design and implementation.

V. Additional Problems Expanding the Digital Divide

We have seen how people with disabilities are locked out of the digital economy web environment due to the lack of accessible design. The digital divide will continue to expand if this issue is not addressed in our research, education and outreach. As the rapid development of new web applications continues, it is necessary to ensure that new barriers are not erected to effective communication and commerce.

This section briefly highlights some of the additional problems currently expanding the digital divide: Internet Services Providers, Internet voting, accessible system design, Internet kiosks, smart cards, electronic textbooks, long-distance learning, and consumer household appliances.

Internet Service Providers

According to a recent study by the American Foundation for the Blind, there are significant accessibility issues to consider when a consumer determines whether or not to utilize on-line services or Internet Service Providers. Although America Online is one of the most popular services for accessing the Internet, it is currently not a good choice for consumers who are blind. Expert screen reader users find it extremely difficult to navigate because of its nonstandard controls (buttons and icons) and lack of keyboard commands.

The study also examined CompuServe and concluded that although it was more usable than America Online, its forums and chat rooms present accessibility problems. The report concluded that the best solution for Internet access for people who are blind is an Internet service provider where the user can choose the most accessible E-mail program and Web browser for the screen reader being utilized.[44]

Internet Voting

As government agencies look to the Internet as an efficient way to conduct elections, it is important to ensure that web pages utilized for voting do not contain accessibility barriers. For example, currently a number of Fortune 500 companies provide Internet voting as an option for shareholder participation at annual or special business meetings and are unaware that there are accessibility barriers at their web sites. This problem should be a reminder for governments that Internet voting for local, state or national elections requires accessible web design to prevent the disfranchisement of people with disabilities.

Accessible System Design

As governmental entities and businesses employ policies to satisfy ADA Title II or ADA Title I requirements, a systemic review similar to the Year 2K problem should be underway to remove accessible system design barriers impacting employees and consumers. For example, designers of statewide or agency computer systems should be addressing the impact of their design 'upgrade' on current employees using assistive computer technology. Employees with disabilities should not be suddenly losing their ability to do their job because of this lack of planning.

Even if a vendor has a package with built-in accessibility features, it is important that people with disabilities are involved in the development of the product as well as in the procurement of the product. By including this knowledge on the team, system planning can anticipate and address compatibility, accessibility and implementation issues. Examples of some of the problematic issues include: the transfer of human resources/payroll/product inventory databases to particular intranet environment formats not friendly to screenreader access or keyboard navigation; the intranet 'upgrade' to database search engine capability when the search engine itself is not accessible to screenreaders; or the inaccessible design of a web-based vendor platform for conducting on-line business. Research is needed on how to best incorporate difference and choice to address this growing problem. The author has received numerous calls from state and business entities across the nation seeking solutions after a system upgrade "bumped" an employee from the workplace.

Internet Kiosks

Internet kiosks and information technology machines (ITM) are appearing in the marketplace without ensuring accessibility for people with disabilities. Whether the barrier is a touch screen feature or other inaccessible element, specific guidelines are needed for the industry to address functional requirements. The Access Board has been researching the accessibility of ITM's and a draft copy of their final report can be accessed from their web site at <http://www.access-board.gov>.

Smart Cards

Smart cards, whether they are in the shape of credit cards, keys or rings, or demand vision to

access digital displays of random password entry numbers for operation, require accessible design considerations. As businesses and governmental agencies increase their investment in these products for security or employee identification reasons, the number of consumers and employees impacted by the lack of accessible design will increase. Solutions are needed to address this problem.

Electronic Textbooks

Currently the State of Texas Education Code[45] requires the Texas Education Agency to develop a study project to determine the costs and benefits of using computer networks, including the Internet in public schools. The issues to be studied include electronic delivery of textbooks and supplement updates as well as the feasibility and cost-effectiveness of producing electronic textbooks for students with disabilities.

In response to this mandate, the Texas Education Agency issued their report in February 1999 entitled, Report on the Computer Network Study Project.[46] This comprehensive report includes the following recommendations:

- Establish an advisory committee to develop guidelines for designing accessible, interactive electronic instructional materials including simulations.
- Fund a study of the costs for developing accessible electronic textbooks[47] as well as two demonstration projects for developing two interactive electronic textbooks: one electronic textbook to be CD-ROM-based that students with disabilities can use without assistive technology devices; the other an interactive accessible Internet-based or Intranet-based textbook that students with disabilities can use without assistive technology devices
- Require beginning in the year 2003 all CD-ROM textbooks or materials adopted by the State Board of Education comply with the basic accessibility requirements contained in the report
- Require beginning in the year 2003 all Internet-based or Intranet-based textbooks adopted by the State Board of Education comply with the accessibility guidelines of the World Wide Web Consortium
- Require that all materials purchased by Texas public schools for preparing students to take standardized and college entrance examinations be accessible to students with disabilities.

Likewise, in the State of California, Assembly Bill 422[48] requires publishers of textbooks and instructional materials to provide an electronic version for people with disabilities if the material is required as part of a course or study in a community college, the California State University or the University of California. A second bill, Assembly Bill 609[49], addresses the needs of grades kindergarten through twelve and includes the requirement that publishers

of instructional materials provide the state, at no cost, computer files or electronic versions of the instructional material. Lastly, a third bill, Assembly Bill 395[50], provides conformity with the IDEA for special education programs and requires publishers and manufacturers to provide instructional materials to the state in electronic format compatible with Braille translation and speech synthesis software.

The efforts in Texas and California are timely and if successful, then another barrier in the digital divide will fall.

Long Distance Learning

The growth of the Internet has created virtual universities and on-line courses that have not been designed to allow people with disabilities to participate. Whether or not these on-line courses are being taken by students or by employees, inaccessible design is a barrier. As mentioned earlier, the January 22, 1998 California Community OCR Findings identified this problem:

California Community Colleges, individually and collectively as part of the California Virtual University, are rapidly developing their capacity to deliver educational programs to offsite students through technology. Little attention is being given to ensure that these distance learning programs are accessible to students with disabilities, especially students with visual impairments.[51]

The California Community Colleges currently have an enrollment of 4.1 million students and have responded by establishing a Distance Education Accessibility Work Group to develop Distance Education Accessibility Guidelines. The draft guidelines are currently under review by a variety of groups within the system including the Academic Senate for California Community Colleges, the general Distance Education Technology Advisory Committee, the Distance Education Accessibility Work Group, DSPS Regional Coordinators, and the High Tech Center Training Unit Advisory Committee. It is expected that once feedback is received and incorporated, the Chancellor of the California Community Colleges will issue final guidelines.[52]

As of the writing of this paper, the California Community College long distance learning guidelines will require all newly developed or acquired distance education curricula and instructional materials to be accessible for people with disabilities. In addition, as part of the six year curriculum review cycle for accreditation, all existing curricula and instructional materials are to be reviewed and revised, if necessary, to provide accessibility.[53]

Household Appliances

Digital components with touch screen or flat screen displays are bringing common household appliances into the digital age. Unfortunately, consumers with disabilities are finding they cannot use these appliances. Whereas household appliance switches and knob settings can be Brailled so that people with visual disabilities can operate the appliances, this

solution is not available for appliances utilizing digital operational displays. Some of the common household appliances converting to a digital operation display include stoves, microwaves, dishwashing machines, and clothes washing/drying machines.

VI. Emerging Solutions to Overcoming the Digital Divide

This section highlights two particular efforts underway to address the problems of barriers in web page design and the Internet environment: City of San Jose, California, web accessibility effort and the World Wide Web Consortium Web Accessibility Initiative. It also highlights some of the emerging benefits that extend beyond the community of people with disabilities.

City of San Jose Web Page Disability Access Design Standard

As the ADA Compliance Officer for the City of San Jose, the author participated on an Internet Home Page Team from October 1995 through June 1996. Our team purpose statement was “to lay a foundation including the establishment of standards, goals and guidelines for the City of San Jose’s Internet World Wide Web Pages.” Of particular concern was the filing of an ADA administrative complaint against the City of San Jose by a blind City Commissioner. The Commissioner complained that she was unable to access City Council documents as part of her work in advising City Council because the documents were posted in an inaccessible format, ie. portable document format (pdf).

By June 1996, the City of San Jose Web Page Disability Access Design Standard was developed in response to the monitoring of ADA Internet complaints and the need to incorporate City ADA implementation policies.[54] By integrating the requirements of the ADA and applying Universal design principles, we have ensured the widest public access to City electronic government information and services.[55] Currently these standards are being incorporated into our web site and are subject to change as technology advances to solve digital barriers and integrate access tool kits in web-authoring tools.

Just as curbcuts enable people using wheelchairs to navigate our City streets, “electronic curbcuts”[56] enable people with disabilities to navigate the digital economy. There are seven basic requirements in the City of San Jose minimum accessible web design standard:[57]

1. Provide an Access Instruction Page for Visitors (includes email hyperlink for visitors to communicate problems with web page accessibility)[58]
2. Provide support for text browsers[59]
3. Attach “Alt” tags to graphic images so that screenreaders can identify the graphic[60]
4. Hyperlink photographs with descriptive text “D”[61]
5. Caption all audio and video clips by using “CC” hyperlinks[62]
6. Provide alternative mechanism for on-line forms (such as email or voice/TTY phone

numbers)[63]

7. Avoid access barriers such as the posting of documents in PDF, table, newspaper or frame format or requiring visitors to download software. If posting in PDF, the HTML text or ASCII file must also be posted.[64]

As a result of our web accessibility effort,[65] the City of San Jose was awarded the League of California Cities Helen Putnam Grand Prize for Excellence[66] as well as recognition as a “best practices” model by the United States General Services Administration Center for Information Technology Accommodation.[67] The author’s effort also led to being named to the “Top 25 Women on the Web” by Webgrlrs International.[68]

World Wide Web Consortium Web Accessibility Initiative

On May 5, 1999 the World Wide Web Consortium (W3C) announced the release of the "Web Content Accessibility Guidelines 1.0"[69] specification as a W3C Recommendation. This significant development provides a stable specification that has been reviewed and recommended by the W3C Membership as a tool for making web sites accessible. As Tim Berners-Lee, W3C Director and inventor of the World Wide Web aptly states: “The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect.”[70]

The W3C Recommendation is evidence of the W3C commitment to lead the way to full participation on the Web for everyone and is an important step since the launch of the Web Accessibility Initiative (WAI) April 1997 in the County of Santa Clara, California.[71]

The W3C Web Accessibility Initiative (WAI) recognizes the problem of barriers on the Web for people with disabilities and is committed to pursuing solutions through five primary activities:

- Ensuring that Web technologies support accessibility
- Developing guidelines for accessibility
- Developing tools to evaluate and facilitate accessibility
- Conducting education and outreach
- Monitoring and engaging in research and development[72]

The WAI technical activity addresses technology, guidelines and tools coordinated through the International Program Office. For example, in the technology arena, WAI has identified the following areas for accessibility needs: HTML, Style Sheets, Multimedia, MathML, DOM, XML, Graphics, Mobile Access, Internationalization. Currently there is a Protocols and Formats Working Group as well as an HTML/CSS Review Working Group.[73]

In the area of web accessibility guidelines critical for web site development and web application development, the WAI is coordinating page authoring guidelines[74] for accessible web sites; user agent guidelines,[75] such as browsers and multimedia players; and authoring tool guidelines,[76] such as editors and site management tools. Currently there is a Web Content Guidelines Working Group, a User Agent Guidelines Working Group and an Authoring Tools Guidelines Working Group.[77]

Lastly, in the area of tools to facilitate web accessibility, the WAI is coordinating an effort to develop tools for evaluation, repair and proxy conversions. Currently there is an Evaluation and Repair Interest Group and an Evaluation and Repair Working Group.[78]

The WAI International Program Office focuses on education and outreach and is separately funded by W3C Member activities, governments and corporations. For example, sponsors include the U.S. National Science Foundation, U.S. Department of Education National Institute on Disability and Rehabilitation Research, European Commission's TIDE Programme under Directorate Generale XIII, Microsoft Corporation, IBM, Lotus Development Corporation and NCR.[79]

VII. Accessibility Rules and Research for the Digital Economy

As stated in a recent report by the President's Information Technology Advisory Committee:

As we have the opportunity to use information technology to strengthen our societal institutions, we must understand the potential pitfalls, and the safeguards we must put in place to achieve both a free and fair flow of information.[80]

Overcoming the digital divide for people with disabilities requires a "free and fair flow of information" safeguarded by civil rights. Civil rights principles should guide policymakers in the application of technology in the emerging digital economy. Although information technology changes; civil rights principles do not.[81]

Already our civil rights statutes require government to consult the community of people with disabilities whenever policies, services or programs impact their community. There has also been a significant shift to include people with disabilities in the design, research and development of assistive technology.[82]

In *More Than Screen Deep: Toward Every-Citizen Interfaces to the Nation's Information Infrastructure*,[83] three recommendations are offered for federal research that are supported by the author of this White Paper:

1. Break away from 1960s technologies and paradigms with a research agenda acknowledging that the "human-machine interface is more than screen deep and should consider every aspect of a person's experience in using computing and communications." [84]
2. Invest in the research required to provide the component subsystems needed for every-citizen interfaces with the highest priority being the determination of citizens' needs.[85]
3. Encourage research on systems-level design and development of human-machine interfaces that support multiperson, multimachine groups as well as individuals.[86]

In addition, overcoming the digital divide also requires collaboration in open source technologies[87] because civil rights principles reinforce the greater value of the functionality returned through the collaboration.[88] Yet, according to Shapiro and Varian, there is the problem that

Open standards are prone to “splintering,” or “fragmentation.” Splintering of a standard refers to the emergence of multiple, incompatible versions of a standardized technology. . . .Open standards can also be “hijacked” by companies seeking to extend them in proprietary directions, and thus in time gain control over the installed base. Microsoft has been accused of trying to extend both Java and HTML in proprietary directions.[89]

Perhaps research is needed on how to best manage open standards where civil right protections are afforded the community of people with disabilities in their access to technology. As suggested by O’Reilly, an area for future study is “where the ideal boundary ought to be between a core product controlled by a single individual or small team, and the input of the user community.”[90]

Lastly, civil rights principles should guide researchers as the federal government addresses the ten critical “National Challenge Transformations” identified by the President’s Information Technology Advisory Committee:

These information technology transformations will affect how we communicate,[91] how we store and access information,[92] how we become healthier and receive proper medical care,[93] how we learn,[94] how we conduct business,[95] how we work,[96] how we design and build things,[97] how we conduct research,[98] how we sustain a livable environment,[99] and how we manage our government in the next millennium.[100]

As our national research agenda addresses these critical issues, this White Paper calls for fairness and equity and echoes the view of the National Council on Disability[101] that

If equal access to multimedia for people with disabilities is to become a reality, knowledge and awareness will have to be developed across all areas.[102]

A robust and strong digital economy requires the removal of barriers through the deployment of accessible design elements in our computer, information technology and communications. By directing our research and policy directives to address these problems, we will overcome the digital divide and ensure full participation in the global digital economy.

- [1] "Understanding the Digital Economy" conference, May 25 and 26, 1999, <http://www.digitaleconomy.gov/>
- [2] National Center for the Dissemination of Disability Research, "Who Needs Web Site Accessibility?" The Research Exchange 3, no. 3 (1998): 1-5. <http://www.ncddr.org/researchexchange/> According to this article, estimates of the total number of Americans vary according to the criteria used. The figure of 43 million was stated in the Americans with Disabilities Act of 1990 (Public Law 101-336, 104 Stat. 327, codified as amended at 42 U.S.C. §§ 12101-12213 (1994)). Another figure of 36.1 million was proposed by the Disability Statistics Rehabilitation Research and Training Center based on data from the 1990 National Health Interview Survey and additional sources. The National Council on Disability Bulletin (September 1997) cited the figure of 54 million.
- [3] See Susan Brummel and William E. Smith, "The Challenge Toward Science-Enabled Governance: Realizing Embedded Levels of Engagement in a Smart Process" <http://www.isi.edu/nsf/papers/nsfsb.html> See also Katherine Thornberry, "City Worker Ensures Web is Accessible to Everyone," Silicon Valley Business Journal, October 27, 1997 (hereinafter cited as Thornberry, "City Worker Ensures Web is Accessible") <http://www.amcity.com/sanjose/stories/102797/focus3.html>
- [4] Cynthia D. Waddell, "Applying the ADA to the Internet: A Web Accessibility Standard," presented at the American Bar Association national summit on disability law and policy: In Pursuit-A Blueprint for Disability Law and Policy, June 17, 1998 (hereinafter cited as Waddell, "Applying the ADA to the Internet") <http://www.rit.edu/~easi/law/weblaw1.htm>
- [5] Susan Brummel, "People with Disabilities and the NII: Breaking Down Barriers, Building Choice," September 1994 National Information Infrastructure White Paper, <http://www.itpolicy.gsa.gov/coca/nii.htm>
- [6] See Leslie M. Campbell and Cynthia D. Waddell, "Electronic Curbcuts: How to Build an Accessible Web Site," CAPED Communiqué, (California Association on Postsecondary Education and Disability, Spring 1997) (hereinafter cited as Campbell and Waddell, "Electronic Curbcuts") <http://www.prodworks.com/ilf/w5bcw.htm>
- [7] <http://www.ncd.gov/>
- [8] National Council on Disability, "Access to Multimedia Technology by People with Sensory Disabilities," (Washington, DC: National Council on Disability, March 13, 1998), p. 52 (hereinafter cited as NCD, "Access to Multimedia Technology") <http://www.ncd.gov/publications/sensory.html>
- [9] Carl Shapiro and Hal R. Varian, Information Rules: A Strategic Guide to the Network Economy, (Boston, Massachusetts: Harvard Business School Press, 1999), p. 6. (hereinafter cited as Shapiro and Varian, Information Rules) <http://inforules.com>
- [10] Lessig, Lawrence, "Cyber-Governance," CPSR Newsletter - Computer Professionals for Social Responsibility 16, no. 4, (Fall, 1998) pp. 1,4.

[11] Pub. L. No. 93-112 § 504, 87 Stat. 355, 394 (codified as amended at 29 U.S.C. § 794 (1994)). Rehabilitation Act of 1973 mandates reasonable accommodation and least restrictive environments in federally funded employment and higher education; requires assistive technology and services to people with disabilities.

[12] Section 508 was originally added to the Rehabilitation Act in 1986. In 1998 Section 508 was revised under the Workforce Investment Act of 1998, Pub. L. No. 105-220, 112 Stat. 936 (1998)(codified at 29 U.S.C. § 798). The revision expands and strengthens the technology access requirements in Section 508. Sec. 408(b), § 508, 112 Stat. at 1203-06. Section 508 applies to Federal departments and agencies and does not apply to recipients of Federal funds. However, states receiving Federal funds under the Tech Act are required to comply with Section 508. The text of Section 508 can be found at <http://www.usdoj.gov/crt/508>

[13] Pub. L. No. 99-506, 100 Stat. 1807 (codified as amended at 29 U.S.C. §§ 716-717, 794d, and 42 U.S.C. §§ 2000d-7 (1994) requiring states to include assistive technology services in plans for clients with disabilities and mandates equal access to all electronic equipment in federal workplaces.

[14] Pub. L. No. 100-407, 102 Stat. 1044 (codified as amended at 29 U.S.C. § 2201-2288 (Supp. 1996)) Congress amended this statute in 1994:

Technology-related Assistance for Individuals with Disabilities Amendments of 1994, Pub. L. No. 103-218, 108 Stat. 50 (Supp. II 1996)(codified in 29 U.S.C. § 2201 note and in various sections of 29 U. S.C.) It is interesting to note that the statute recognized a growing digital divide:

“Many individuals with disabilities cannot access existing telecommunications and information technologies and are at risk of not being able to access developing technologies. The failure of Federal and State governments, hardware manufacturers, software designers, information systems managers, and telecommunications service providers to account for the specific needs of individuals with disabilities results in the exclusion of such individuals from the use of telecommunications and information technologies and results in unnecessary costs associated with the retrofitting of devices and product services.” 29 U.S.C. § 2201(a)(7)(Supp.II 1996).

[15] Pub. L. No. 101-336, 104 Stat. 327 (codified as amended at 42 U.S.C. §§ 12101-12213 (1994). The ADA extends sections 503, 504 and 508 of the Rehabilitation Act to all qualified individuals with disabilities.

[16] Pub. L. No. 101-476, 104 Stat. 1103(codified as amended at 20 U.S.C. 1400 (1994)) extending assistive technology devices and services definition to education.

[17] Pub. L. No. 94-142, 89 Stat. 773 (codified as amended at 20 U.S.C. §§ 1401-1461 (1994)) extending reasonable accommodation and least restrictive environment provision of the Rehabilitation Act to ages five through twenty-one in education; provides for assistive technology to play a significant role in access to educational programs.

[18] Pub. L. No. 99-457, 100 Stat. 1145 (1986)(codified as amended at 20 U.S.C. §§ 1471-1485 (1994)) extending EAHHC to infants and children up

to five years and expanding provisions on education-related assistive technology.

[19] Pub. L. No. 104-104, 110 Stat. 56 (1996) Two provisions of the Telecommunications Act address specific access needs for people with

disabilities: Sections 255 and 713. Section 255 requires all manufacturers of telecommunications equipment and providers of

telecommunications services to ensure that equipment and services are accessible, if readily achievable. Section 713 seeks to ensure that video

services are accessible to people with hearing and speech disabilities. For example, closed captioning and video description provisions are

mechanisms for providing accessibility. The Access Board guidelines for compliance with the Telecommunications Act of 1996 are found at

<http://www.access-board.gov/rules/telfinl2.htm>

[20] Pub. L. No. 104-107, 110 Stat. 2394, 2416 (Legislative Branch Appropriations Act, 1997, adding new section 121 to Title 17 U.S. Code)

providing exemption from copyright infringement for an authorized entity to reproduce or to distribute copies or phonorecords in specialized

formats exclusively for use by blind or other people with disabilities.

[21] Pub. L. No. 105-17 Recently re-authorized and strengthened as the Individuals with Disabilities Education Act Amendments of 1997.

[22] United States Commission on Civil Rights, Helping State and Local Governments Comply with the ADA: An Assessment of How the

United States Department of Justice Is Enforcing Title II, Subpart A, of the Americans with Disabilities Act, (Washington, DC: U.S.

Commission on Civil Rights, September 1998) pp. 10-11(hereinafter cited as U.S. Commission on Civil Rights, Helping State and Local

Governments Comply with the ADA) <http://www.usccr.gov/>

[23] Waddell, "Applying the ADA to the Internet" <http://www.rit.edu/~easi/law/weblaw1.htm>

[24] Deval Patrick, Assistant Attorney General, Civil Rights Division, U. S. Department of Justice, letter to Tom Harkin, U. S. Senate, re

application of the ADA to "web pages" on the Internet, September 9, 1996, 10 NDLR ¶ 240.

[25] U.S. Commission on Civil Rights, Helping State and Local Governments Comply with the ADA, p.111.

[26] See 28 C.F.R. § 36.303; 28 C.F.R. § 35.160.

[27] Waddell, Cynthia D. and Kevin Thomason, "Is Your Site ADA-Compliant? or a Lawsuit-in-Waiting?", The Internet Lawyer, (New York:

GoAhead Productions, November 1998) no. 4.11 <http://www.internetlawyer.com>

[28] See Workforce Investment Act of 1998, Pub. L. No. 105-220, 112 Stat. 936 (1998).

[29] April 2, 1999 Memorandum from Attorney General Janet Reno to Heads of All Federal Agencies, Subject: Electronic and Information

Technology (hereinafter cited as Attorney General Reno Memo)

<http://www.usdoj.gov/crt/508/memohead.html>

[30] For checklists: <http://www.usdoj.gov/crt/508/508docs.html> and for Resource Guide:

<http://www.usdoj.gov/crt/508/508home.html>

[31] Attorney General Reno Memo, <http://www.usdoj.gov/crt/508/memohead.html>

[32] As part of the rulemaking process, the Access Board has convened the EITAAC (Electronic and Information Technology Advisory Committee) to advise the Board as it develops the standards. <http://www.access-board.gov/>

[33] See OCR Letter Docket Number 09-95-2206, pp. 1-2; 28 C.F.R. § 35.160(a) <http://www.rit.edu/~easi/law/sjsu.html>

[34] See OCR Letter Docket No. 09-97-2002, p. 1. <http://www.rit.edu/~easi/law/csula.html>

[35] Ibid.

[36] Ibid., p. 2.

[37] Ibid.

[38] Ibid.

[39] Ibid.

[40] January 22, 1998 letter from Stefan Rosenzweig, Regional Director, U.S. Department of Education, Office for Civil Rights to Thomas J. Naussbaum, Chancellor, California Community Colleges (hereinafter cited as OCR Letter dated 1/22/98) <http://www.rit.edu/~easi/law/ocrsurltr.html>

[41] See March 9, 1999 letter from Ralph Black, General Counsel for the California Community Colleges to Paul Grossman, Chief Regional Attorney, U.S. Department of Education, Office for Civil Rights re Case Docket No 09-97-6001 (hereinafter cited as OCR Letter dated 3/9/99).

[42] OCR Letter dated 1/22/98, p. 5. <http://www.rit.edu/~easi/law/ocrsurltr.html>

[43] OCR Letter Docket No. 09-99-2041 dated April 20, 1999 from Robert E. Scott, Team Leader, Office for Civil Rights, U.S. Department of Education, p. 2.

[44] Crista L. Carl and Jay D. Leventhal, "Accessing On-Line Services with Synthetic Speech: America Online, CompuServe, and Internet Service Providers," *Journal of Visual Impairment & Blindness*, (New York: American Foundation for the Blind, 1998) 92, no. 8, pp. 545-551.

[45] Section 32.037 of the Texas Education Code was legislated by Senate Bill 294 and enacted by the 75th Texas Legislature.

[46] See <http://www.tea.state.tx.us/Textbooks/cns/cnstemp.htm>

[47] The Texas Education Code defines electronic textbook as "computer software, interactive videodisc, magnetic media, CD-ROM, computer courseware, online services, an electronic medium, or other means of conveying information to the student or otherwise contributing to the learning process through electronic means." Section 31.001(1). This definition does not address the accessibility issues of electronic textbook content and the method of presentation of that content.

[48] See <http://www.leginfo.ca.gov/bilinfo.html> for status of California Assembly Bill 422.

[49] See <http://www.leginfo.ca.gov/bilinfo.html> for status of California Assembly Bill 609.

[50] See <http://www.leginfo.ca.gov/bilinfo.html> for status of California Assembly Bill 395.

[51] OCR Letter dated 1/22/98, p. 4. See <http://www.rit.edu/~easi/law/ocrsurltr.html>. One particular distance education resource referenced in the OCR letter was the University of Toronto, Canada effort at <http://www.utoronto.ca/atrc/rd/library/papers/accspe.html> Recently, at a March

1999 California State University at Northridge (CSUN) "Technology of Persons with Disabilities" conference, an interesting project paper was presented entitled "Adding Feeling, Sound and Equal Access to Distance Education" by Jutta Treviranus of the Adaptive Technology Resource Centre, University of Toronto.

http://www.dinf.org/csun_99/session0112.html

[52] OCR Letter dated 3/9/99, p. 4.

[53] Ibid.

[54] See City of San Jose Web Page Disability Access Design Standard at

<http://www.ci.san-jose.ca.us/oaacc/disaccess.html>

[55] See Waddell, "Applying the ADA to the Internet"

<http://www.rit.edu/~easi/law/weblaw1.htm>

[56] Campbell and Waddell, "Electronic Curbcuts" <http://www.prodworks.com/ilf/w5bcw.htm>

For a definition of what is meant by accessible

web design, see discussion by Chuck Letourneau, Starling Access Services at

<http://www.starlingweb.com/webac.htm>

[57] See <http://www.ci.san-jose.ca.us/oaacc/disaccess.html> for further detail on these standards for City webmasters and consultants. These

standards are derived from ADA policies and procedures found in the City of San Jose ADA Self-Evaluation and Transition Plan, the ADA

statute itself, case law, regulations, ADA Technical Assistance Manuals and other agency interpretive tools. ADA policies include: 1) the

ADA Alternate Document Format Notice 2) the ADA Public Notice for requesting accommodations for access to public meetings and events 3)

the third party contractor ADA compliance requirement 4) the City of San Jose ADA Title II complaint process for citizens 4) the ongoing duty

to remove barriers in access to our City programs, services and facilities and 5) the ADA requirement that people with disabilities, such as the

City Disability Advisory Commission, are consulted when developing policies, programs or services impacting their community.

[58] The Access Instruction page publishes the contact name and email of the ADA Coordinator responsible for investigating and resolving

ADA Title II complaints as required under the statute and facilitates the internal resolution of complaints concerning inaccessible web design.

<http://www.ci.san-jose.ca.us/access.html>

[59] Ideally, a web site should display the same information on the web page for all visitors and should not require the maintenance of a

separate text-only site. Anecdotal evidence suggests that there is a higher cost for maintaining parallel web sites because webmasters tend to

update the graphical version and not the text-only version.

[60] Screenreaders cannot audibly read out loud the text or links embedded within graphics. This is also true for screenreaders encountering a

PDF document. Visitors to web sites with slow modems have also found that they can quickly download a web site utilizing Alt-tags by turning

off their graphics.

[61] This feature was adopted from the Center for Accessible Media at <http://www.wgbh.org/wgbh/pages/ncam/accessncam.html#visim>

[62] Ibid.

[63] On-line forms that enable keyboard navigation and input are helpful but can be difficult to read by certain text browsers. A good customer service strategy is to provide an email or voice/TTY phone number as an alternative means of communication.

[64] See <http://www.ci.san-jose.ca.us/oaacc/disaccs.html> as well as <http://www.w3.org/TR/WAI-WEBCONTENT/>

[65] For background article on web accessibility effort see Thornberry, "City Worker Ensures Web is Accessible."

<http://www.amcity.com/sanjose/stories/102797/focus3.html> The author was also named to the "Top 25 Women on the Web" by Webgrrls

International, San Francisco chapter. See <http://www.webgrrls.com/sf/25women.htm>

[66] See http://www.sjpl.lib.ca.us/Home/Archives/awards/hp_award.htm/

[67] See <http://www.itpolicy.gsa.gov/mkm/gsaep/top.htm/>

[68] See <http://www.webgrrls.com/sf/25women.htm>

[69] See <http://www.w3.org/TR/WAI-WEBCONTENT/>

[70] See <http://www.w3.org/WAI/>

[71] Only by coincidence was the WAI launch made in the only local governmental jurisdiction that had adopted minimal web accessibility standards. In fact, the Board of Supervisors for the County of Santa Clara had adopted the City of San Jose web accessibility standard the previous month in March, 1997.

[72] See <http://www.w3.org/WAI/>

[73] Ibid.

[74] For Web Content Accessibility Guidelines, see <http://www.w3.org/tr/wd-wai-pageauth/>

[75] For User Agent Accessibility Guidelines, see <http://www.w3.org/TR/WAI-USERAGENT>

[76] For Authoring Tool Accessibility Guidelines, see <http://www.w3.org/tr/wd-wai-autools/>

[77] See <http://www.w3.org/WAI>

[78] Ibid.

[79] Ibid

[80] President's Information Technology Advisory Committee Report to the President, "Information Technology Research: Investing in Our Future" February 1999 <http://www.ccic.gov/ac/report>

[81] This thesis is analogous to that expressed by Shapiro and Varian, Information Rules, p. 2; in their discussion concerning the information

economy, the authors point out that "[t]echnology changes. Economic laws do not."

[82] Berven, Heidi M. & Peter David Blanck, "The Economics of the Americans with Disabilities Act Part II: Patents and Innovations in Assistive Technology," Notre Dame Journal of Law, Ethics & Public Policy, 12 ND J.L. Ethics & Pub Pol'y 9, 1998. According to this resource, historically there was a clear distinction between normal and abnormal; technology justified by disability stereotyping include life-ending technology, restraining technology, punishing technology, cure technology, medical technology and simple and safe technology. As a result,

“[I]ndividuals with disabilities were excluded from the assistive technology design process and found themselves dependent on public programs for decisions regarding technology. Dominant models and definitions of disability, based on medical, economic and minority paradigms characterized disability in the context of particular institutional systems. Each provided an incomplete picture of the meaning and consequences of disability.”

[83] Computer Science and Telecommunications Board, Commission on Physical Sciences, Mathematics, and Applications, National Research Council, *More Than Screen Deep: Toward Every-Citizen Interfaces to the Nation's Information Infrastructure* (Washington D.C: National Academy Press 1997) <http://www.nap.edu/readingroom/books/screen>

[84] *Ibid.*, p. 193.

[85] *Ibid.*, p. 195.

[86] *Ibid.*, p. 196.

[87] O'Reilly, Tim, “Lessons from Open-Source Software Development,” *Communications of the ACM*, 42, no. 4, April 1999, p. 34 (hereinafter cited as O'Reilly) “Officially, open source (which is a trademark of the Open Source Initiative – see <http://www.opensource.org>) means more than the source code is available. The source must be available for redistribution without restriction and without charge; and the license must permit the creation of modifications and derivative works, and must allow those derivatives to be redistributed under the same terms as the original work.”

[88] According to O'Reilly, “whether or not open-source technologies succeed as packaged products, their greatest economic contribution may be the new services that they enable.” *Ibid.*, p 34.

[89] Shapiro and Varian, *Information Rules*, pp. 256, 257.

[90] O'Reilly, p. 37.

[91] President's Information Technology Advisory Committee Report to the President, “Information Technology Research: Investing in Our Future, February 1999, p. 12, <http://www.ccic.gov/ac/report> Communication can occur “regardless of physical limitations of the individual, because devices can accept and provide input and output in many different ways.”

[92] *Ibid.*, p. 13. “Systems will require interfaces accessible both to experts and novice or infrequent users regardless of physical ability, education or culture.”

[93] *Ibid.*, p. 14. “Patients are empowered in making decisions about their own care through new models of interaction with their physicians and ever-increasing access to biomedical information via digital medical libraries and the Internet.”

[94] *Ibid.* “We know too little about the best ways to use computing and communications technology for effective teaching and learning, in particular, how to effectively use multimedia capabilities to create a richer, and more appealing learning experience.”

[95] *Ibid.* “Any company can be easily reached by its customers, regardless of location. . . . Consumers can shop for the best products, services

and prices from the convenience of their hotel room, home or office.”

[96] Ibid, p. 15 “A highly flexible workplace is able to accommodate each individual’s needs, from working parents to workers with disabilities.”

[97] Ibid. “Designers, manufacturers/builders, suppliers, and end-users participate in the design process, providing one another immediate feedback.”

[98] Ibid, p. 16. “Research problems are becoming more complex and interdisciplinary in nature. As a result, researchers are finding innovative ways to collaborate with their colleagues across the globe.”

[99] Ibid. “Fully integrated models allow scientists and policy makers to consider information on climate trends, populations trends, resource utilization, and the value of natural and economic resources when making decisions regarding technically feasible and cost-effective options to reduce environmental impacts or adapt to climate change.”

[100] Ibid, p. 17. “Government services and information are easily accessible to citizens, regardless of their physical location, level of computer literacy, or physical capacity. . . . It is imperative that improvements in government be available to all citizens, so we must understand and surmount barriers to access.”

[101]<http://www.ncd.gov>

[102] NCD, “Access to Multimedia Technology” <http://www.ncd.gov/publications/sensory.html>

IT R&D: Incorporating Accessibility for People with Disabilities

A Presentation by

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Office of Special Education and Rehabilitative Services
U.S. Department of Education**

To the

President's Information Technology Advisory Committee

May 18, 2000

Good Morning. I would like to thank the members of Presidents' Information Technology Advisory Committee and Dr. Comedy for inviting me to speak here today. First I will describe the U.S. Department of Education for those of you who may not be familiar with us and comment on the PITAC report of February 1999. I will then review briefly how the research efforts concerning disability have produced useful technologies for all people, and examine how a focus on disability might help the nation's Information Technology (IT) Research and Development (R&D) effort in the coming years. I will also review some of the legislation that has provided access to IT for people with disabilities and some current efforts to make IT accessible. To conclude my talk, I will recommend ways that PITAC could help improve accessibility.

1. Education, OSERS, and NIDRR

The U.S. Department of Education contributes a substantial amount to the federal research investment for people with disabilities. One example of this commitment is an award-winning Assistive Technology Program, developed by the Office of the Chief Information Officer (OCIO). This program is a model for federal agencies seeking to meet requirements under Section 508 of the Rehabilitation Act, which I will say more about later.

Also our Office of Special Education and Rehabilitative Services (OSERS) supports programs that educate children with special needs, rehabilitate youth and adults with disabilities, and conduct research to improve the lives of individuals with disabilities of all ages.

One of the components of OSERS is the National Institute on Disability and Rehabilitation Research (NIDRR), which conducts comprehensive and coordinated programs of research and related activities to maximize the inclusion, social integration, employment, and independent living of disabled individuals of throughout life. Balanced between the scientific and consumer communities, NIDRR plays a unique role in federally funded research activities related to disability. NIDRR represents the largest concentration of such research in the government. In addition, NIDRR's work helps to more fully integrate disability research into the mainstream of our nation's policies regarding science and technology, health care, and economics.

Our lives are increasingly linked to IT. That is one of the main reasons I am here this morning and the specific topic I will address.

2. Comments on the PITAC Report

I would like to complement PITAC on its February 1999 report, and the vision expressed therein. I would also like to highlight some sections of the report that I found compelling.

(Note smaller font is direct quotes from report, emphasis on all added)

"Finally, Federal budgets must continue to ensure that advances in information technology work to benefit *all* Americans and that *all* Americans have the education and training needed to prosper in a world that will increasingly depend on information technology.

"Information technology will significantly improve the flow of information to *all* people and institutions in the Nation, and could be a powerful tool for democratization."

Under the heading "The Government's Essential Role," the report notes:

"Enormous societal gains can be reaped from advances in information technology. Only through research on a scale substantially greater than is being carried out today can we build an infrastructure that will be available, affordable and usable by *all* citizens--one that can support the compelling "transformations" discussed in the next chapter of this report.

"The benefits that the transformations described in the next chapter of this report can have for our Nation's future are extraordinary. A networked society can reach out to *all* its citizens, and can bring our Nation closer together and address many societal issues. While it cannot resolve all these issues, information technology can give us leverage toward their solution."

We need to ask: "What does *all* mean in these paragraphs?"

It appears to mean everybody except certain groups.

Does *all* mean everybody except the blind, who that cannot use a Graphical User Interface (GUI)?

Does *all* mean everybody except individuals with a mobility impairment who can't use a keyboard and mouse?

Further, the report correctly notes:

"Information technology will...make government more responsive and *accessible* to the needs of our citizens."

and

"Current cross-agency coordination mechanisms are working well, but they suffer from the lack of well-defined responsibilities for ensuring that key areas are not overlooked."

and finally,

"The Federal government should: ... Expand the participation of underrepresented minorities and women in computer and information technology careers. "

The key issue that the PITAC report overlooks is that accessibility for *all* people includes people with disabilities. The essential question is: "What is meant by accessibility?" The PITAC has correctly identified the need to increase the representation and participation of women and minorities in the nation's IT R&D effort. Similarly, the nation needs to focus its efforts on access and participation in IT R&D by individuals with disabilities.

Clearly, the bulk of the future federal expenditures in IT R&D will be spent on solving complex technical problems such as increased computing speed, higher bandwidth, and, I hope, improved accessibility. In addition to these technical problems, I agree with the PITAC report that some research must be done on the socioeconomic impact of these rapid changes in IT.

3. Research for the Disabled: How Some "Mainstream" Products Originated

Many technologies that we now take for granted originated from research efforts to make information available to individuals with disabilities. Bell invented the telephone while he was working at a school for deaf. Cassette tapes were developed in a books-for-the-blind program in the United Kingdom, as it was difficult for blind people to use reel-to-reel tape recorders. Closed-caption TV, at first available only as an expensive "add-on" for individuals who were deaf, is now a feature in all televisions. Many people who are not deaf find closed-caption TV useful in noisy rooms, for example, at a bar or in a health club while on a treadmill. Communication via Internet chat rooms is very similar to communication over the now old-fashioned TTY. The Kurzweil Scanner and optical character recognition were originally developed to enable the blind to "read."

Some of these research efforts, such as captioning, were supported by the public sector and others, such as TTY were supported by the private sector (e.g. TTY). The model of taking what we call "orphan technology" (technology that has only a small user population) and moving it into the mainstream may be important to future IT innovations where IT infrastructure and technology are designed to be accessible by all from the initial design phases. A second model that can contribute to future innovations in IT is the process of *universal design*.

A major point here is that our research investments specifically targeted to people with disabilities has paid off: technologies have been developed that were ultimately beneficial to many nondisabled people.

4. How Can a Focus on Disability Help the Nation's IT Effort?

There are three main ways that focusing on disability can help the nation's IT R&D efforts: by increasing innovation, responding to changing demographics, and reducing the need for future federal regulatory intervention.

Innovation:

Why should we be interested in access to IT for individuals with disabilities? When a research community is presented with truly difficult and challenging problems, and given the time and resources it needs to work on them, the results are often innovative solutions. One widely accepted example of this is the Human Genome Project. What would have been unthinkable 20 years ago is now almost a reality, thanks to many biomedical and technical innovations over the past decade, made possible by both federal and private research investments.

There is a desire to increase innovation in IT research. One area, identified by the PITAC Report, is the Human Computer Interface:

"Specifically, the Federal program should support fundamental research in human-computer interfaces and interaction."

When the challenges and problems posed by disabilities are presented to the research community, it is very likely to result in remarkable innovations. Here are some possibilities:

Can you find ways other than using a keyboard and mouse to enter information into a computer? In addition to making communication possible for people who cannot use a keyboard or mouse, wouldn't an alternate method have the potential to decrease the incidence of carpal tunnel syndrome and repetitive motion injuries? Isn't it possible that alternates to the keyboard and mouse could actually be faster and enable people to be even more productive? Speech recognition technologies still have some way to go, but is speech the only possible alternative? And what about people who cannot speak? Might some breakthrough in speech recognition make it possible for these individuals to use computers of the future? The potential for a breakthrough in how people input information into computers is enormous.

Can you find ways other than reading the visual screen or printer page to get information from a computer? As the population ages, more people are losing visual acuity--a significant issue. It has also been suggested that a computer screen is an extremely low-resolution way of conveying information in the first place.

As the age of ubiquitous or pervasive computing dawns, can computers be made smart enough to sense the capabilities of a user and to adjust their input/output accordingly?

Can you find better ways to organize, sort, and filter information so you get what you want quickly and are not burdened with information you don't need? Some people with disabilities typically have low bandwidth input capability. To be productive, they really can't waste time sorting through irrelevant information. How could new search engine technologies and ways of organizing and summarizing information be developed?

Bringing engineers who know about accessibility issues on-board in the early stages of infrastructure and technology development is important. Bringing consumers into the decision-making stages at certain points along the development cycle is also helpful.

Changing Demographics:

Important issues concerning market size and demographics will change the IT user population, particularly the elderly. There is likely to be a strong association between computer use and functional disabilities. The key role of *function* cannot be underestimated.

There is a strong correlation between aging and disability, especially in hearing and vision. The median age of workers was 38 years in 1994. It will be 41 by the year 2005. The number of workers age 55 and older may approach 22.2 million in 2005. The increase of older workers is likely due to a longer life expectancy, better health and fitness, and economic necessity. More people keep working through their 60s and early 70s. Little is known about how they will cope with work, and many of them will probably be working in IT-related jobs. Also, IT may play a role in providing medical care in the home, through Telemedicine and Telerehabilitation.

The term "digital divide" initially referred to the gap in IT due to socioeconomic or racial differences. The notion of a "digital divide," however, applies even more to individuals with disabilities. How can an individual who cannot see possibly use a GUI? How can a person who cannot move his or her hands possibly use a keyboard or mouse? A recent report by H. Stephen Kaye found that people with disabilities are less than half as likely to have access to a home computer than their nondisabled peers, and nondisabled individuals are three times more likely to have access to the Internet than individuals with disabilities. Education has a much bigger impact on labor force participation for individuals with disabilities than for their nondisabled counterparts. Because education is

becoming more and more dependent on IT, accessibility again looms large in importance as a tool for conquering the digital divide.

Reducing the Potential for Future Federal Regulatory Intervention

Most members of the Internet Community do not support federal regulation of the Internet. "Hands off the Internet" is a common phrase. There is at least some probability that federal regulatory intervention to secure accessibility of the Internet will occur in the future. However, if accessibility issues are resolved, at an early stage of IT R&D before the new technologies becomes widely used, federal intervention is less likely. There would be no need to regulate if access were already there.

Obsolescence is a major problem for specialized software and devices for people with disabilities as technology changes. The solution seems to be to make accessibility part of the design process at the earliest possible stages. The concept of *universal access* or *universal design* is a possible solution to this problem. In universal design, the capabilities and needs of all possible users are considered, so that the final product can be used just as easily by people with disabilities as those without disabilities. Also the principles of universal design need to be introduced into the classroom, which is a significant educational challenge. Incorporating accessibility from the beginning is the only workable strategy. The PITAC report notes:

"The information technology industry expends the bulk of its resources, both financial and human, on rapidly bringing products to market...Delivery product cycles are as short as every three to six months. The company that fails here misses the next short-term cycle and will not be successful."

A significant dissemination and training effort is needed to bring accessibility engineering into the IT community. This is particularly important for schools and universities, as well as for many of the small start-up companies that are such driving forces in innovation. This training is one way to help ensure that accessibility is included from the earliest stages of design.

5. Universal Design and Civil Rights Issues

Another approach to making the nation's IT infrastructure accessible to individuals with disabilities is to look at the civil rights issues involved.

In the Television Decoder Circuitry Act of 1990, Congress decided that to the fullest extent possible, deaf and hearing-impaired people should have equal access to television. Prior to the passage of this act, a consumer had to buy a TeleCaption decoder and connect the decoder to a television set to display the closed-captioning. When a deaf consumer was in a public place or at a friend's house watching TV, there would be no captioning. Congress noted that in 1990, technology was now available to enable closed-caption decoding capability to be built into new television sets during manufacture at a nominal cost; and the availability of decoder-equipped television sets would significantly increase the audience that could be served. *This is a sterling example of universal design, anyone getting on treadmill in a noisy health club can watch TV while they work out.*

On February 8, 1996, the President signed the Telecommunications Act of 1996. This act charges the Access Board with responsibility for developing accessibility guidelines for telecommunications equipment and customer premises equipment. The guidelines are required to principally address the access needs of individuals with disabilities affecting hearing, vision, movement, manipulation, speech, and interpretation of information.

Section 255 provides that manufacturers shall ensure that the equipment is designed, developed, and fabricated to be accessible to and usable by individuals with disabilities, if readily achievable. A provider of telecommunications services shall ensure that the service is accessible to and usable by individuals with disabilities, if readily achievable.

In 1998, Congress amended the Rehabilitation Act. As amended, section 508 of the act requires that electronic and information technology that is developed, procured, maintained, or used by federal departments or agencies be accessible to people with disabilities. The law covers all types of electronic and information technology in the federal sector and is not limited to Assistive Technologies used by people with disabilities. Federal agencies must ensure that this technology is accessible to employees and members of the public unless it would pose an "undue burden" to do so. The law directed the Access Board to develop access standards for this technology; these standards will become part of the federal procurement regulations.

6. Current Efforts to Provide Accessible IT

There are many examples of IT R&D efforts today that are addressing the issue of access for individuals with disabilities-more than I could possibly mention in this presentation. For example, Sun has disability access support built into the Java® Platform. This includes screen readers, screen magnifiers, speech recognition systems, and Braille terminals. IBM has a special-needs system, which includes a home page reader for Windows®. Microsoft has worked with the NIDRR-funded Rehabilitation Engineering Research Center at the Trace Center at the University of Wisconsin in Madison to develop accessibility features for Windows®. Microsoft has also made innovative accessibility grant awards for promising research ideas. MCI provides communications services that give people with hearing or speech disabilities the freedom to communicate without limits. MCI TeleRelay Service allows people who use voice telephones and people who use text telephones (TTY) to communicate easily through specially trained communications assistants. Many major universities, such as Stanford and Carnegie Mellon, have human computer interaction programs that are doing research that could prove very valuable to individuals with disabilities.

However, in spite of all these and other efforts, much remains to be done.

7. Conclusion and Recommendations

Due to the substantial and long-term investment in IT advocated by PITAC, there is an urgent and compelling need to raise the issue of accessibility for individuals with disabilities and make resolving this issue a visible and integral part of this effort.

If some web-based entity suddenly announced a policy that no women could use the Internet because they were not as "good at computers" as men, that statement would produce outrage and be quickly reversed. There is nothing less outrageous than continuing to build a system that individuals with disabilities cannot access, and by silently ignoring the problem, say that there is nothing wrong with this.

It can be said that technology, and in particular IT, is so pervasive and essential that one really cannot be a citizen without full access. The PITAC report notes the importance of all citizens having access to IT resources. Research and development can make this a reality.

The goals stated in the PITAC report largely hope to translate the nation's investment in IT research into public good, especially by creating jobs. This is good for the government, nation, economy, and most important, ***all*** citizens. Individuals with disabilities historically have one of the highest rates of unemployment, and accessible IT holds tremendous potential to address this problem.

Recommendations

There is an enormous and compelling need to include disability issues in future IT R&D at a national level.

PITAC should incorporate language in its reports that make it clear that accessibility specifically includes people with disabilities.

PITAC should encourage industrial consortia to take up the issue of accessibility for individuals with disabilities in all new infrastructure, product development and upgrades.

PITAC should encourage the adoption of universal design principles in the future basic IT R&D efforts that will be federally supported at the national level.

PITAC should encourage dissemination of information, curricula, and training materials about accessibility.

PITAC should support the development of the field of access engineering and capacity-building in this field.

PITAC should encourage the exchange of information on accessibility across federal agencies using existing interagency mechanisms, such as the Interagency Committee on Disability Research and the Human Computer Interface and Information Management (HCI & IM) Coordinating Group.

Thank you very much.

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Contact person at NIDRR:

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7. Reference Web Pages

IT-Related Web Sites

Web Accessibility Initiative

<http://www.w3.org/WAI/>

Bobby Approved Web Site Tool

<http://www.cast.com>

Trace Center - IT Accessibility and Universal Design

<http://trace.wisc.edu/>

Access Board

<http://www.access-board.gov/>

The Association of Access Engineering Specialists

<http://www.narte.org/AAES>

Telecommunications Act of 1996, section 255(e)

<http://www.fcc.gov/telecom.html>

Television Decoder Circuitry Act of 1990

<http://www.captions.com/circuit.html>

Section 508 of the Rehabilitation Act

<http://www.usdoj.gov/crt/508/508home.html>

Background and Related Web Sites

Office of Special Education and Rehabilitative Services

<http://www.ed.gov/offices/OSERS/>

National Institute on Disability and Rehabilitation Research

<http://www.ed.gov/offices/OSERS/NIDRR/>

National Center for Dissemination of Disability Research

<http://www.ncddr.org/>

National Rehabilitation Information Center (NARIC)

<http://www.naric.com/>

Rehabilitation Engineering Society of North America

<http://www.resna.org/>

ABLEDATA

<http://www.abledata.com/>

Report on Computer use by People with Disabilities

<http://dsc.ucsf.edu/UCSF/>

Look for Report 13, Computer and Internet Use Among People with Disabilities, by H. Stephen Kaye, Ph.D.

Telerehabilitation

<http://www.hctr.be.cua.edu/RERC/>

Telemedicine

[http:// www.tmgateway.org](http://www.tmgateway.org)

Home Care Technologies

[http:// www.hctr.be.cua.edu/HCTworkshop/HCTs_recom.htm](http://www.hctr.be.cua.edu/HCTworkshop/HCTs_recom.htm)

RERC on Information Technology Access

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Trace Research and Development Center
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Madison WI 53719-1252
Voice: (608) 262-6966
Text Telephone: (608) 263-5408
Fax: (608) 262-8848
Web: <http://trace.wisc.edu>

Abstract

This RERC improves access by individuals with all types, degrees, and combinations of disabilities to a wide range of technologies, including computers, ATMs, kiosks, point-of-sale devices and smartcards, home and pocket information appliances, Internet technologies (XML, XSL, CSS, SMIL, etc.), intranets, and 3-D and immersive environments. As one component in a larger system of consumers, researchers, industry, and policy and public agencies, the Trace Center's program is designed to work within the existing structure, supporting other components and coordinating its efforts to best address the functioning of the whole. The program identifies strategies that can be used by industry to broaden the user base for their standard products, so individuals with as broad a range of abilities as possible are able to use standard products directly. Further, the Center targets specific compatibility and interconnection standards work to ensure that people who cannot use products directly are able to operate them using assistive technologies. The Center focuses on the use of targeted projects and collaboration, both national and international, to carry out the research, development, information dissemination, training, and standard-setting activities required. The approach is intended to be flexible, forward-looking, and broad in scope, yet focused on key access issues as defined by its consumer constituency and its research programs.

NIDRR Project: H133E980008

Start Date: 6/12/98

Length: 60

Funding: FY 98 \$1,350,000

Principal Investigator

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RERC on Telerehabilitation

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Fax: (202) 319-4499
Web: <http://www.hctr.be.cua.edu/RERC/>

Abstract

This project experiments with various models of telerehabilitation for strategic populations, engages in development activities that exploit promising technologies, and focuses on all aspects of the human-technology interface in a broad range of activities that benefit people with disabilities. Structured to include national resources with a strong focus on outreach and dissemination activities and a broad-based set of research activities, the Center focuses on: The Center's research and development activities are: (1) Tele-homecare: telesupport for stroke caregivers; (2) Telecoaching: enhancing job options; (3) Telemonitoring: passive sensing of functional performance and health parameters at home using unobtrusive instrumentation; (4) Tele-assessment: remote evaluation of skin health and decubiti for people with SCI at rural hospitals and clinics using innovative technologies; (5) Telerehab Consumer Toolkit: outreach and development activities and products; (6) Home Telerehab: interactive systems for remote delivery of therapy, assessment, teaching and demonstration at home; (7) Telecounseling and Teleevaluation: remote psychological counseling and neuropsychological evaluation at rural clinics and homes; (8) Behavioral Virtual Reality: investigation and training of social and attending behaviors using virtual environment technology; (9) Teleplay: therapeutic play, including embedded teleassessment for children with disabilities; (10) Integrating Telerehabilitation in Today's Health Care Marketplace. The Center also establishes National Resources activities: (1) Homecare and Telerehabilitation Technology Center; (2) Homecare and Telerehab Education/Training Center; (3) Virtual Library and Dissemination Center; (4) Standards, Codes and Electronic Patient Records (EPR); (5) Telerehab Policy Information Center. The Center will be made up of three institutions: The Catholic University of America (CUA) and the National Rehabilitation Hospital (NRH); and the Sister Kenny Institute (SKI).

NIDRR Project: H133E980025

Start Date: 10/1/98

Length: 60

Funding: FY 98 \$890,000

Principal Investigator

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RERC on Technology Transfer

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Voice: (716) 829-3141

Text Telephone: (800) 628-2281

Fax: (716) 829-3217

Web: <http://wings.buffalo.edu/ot/cat/rerc-t2.htm>

Abstract

This Center improves the quality of life for people with disabilities by: advancing the methods of technology transfer through research, transferring technologies into products through development, and facilitating the commercialization of new and improved assistive devices. These three outcomes are accomplished through collaborations with academic, industrial, consumer and government stakeholders. The Center, a partnership of technical, marketing, and consumer expertise and networks: (1) conducts research on the technology transfer process as it is applied to the field of assistive technology, and develops, validates, and disseminates comprehensive models of technology transfer; (2) applies the research results by implementing the technology transfer process through a development program; (3) identifies and transfers breakthrough technologies to industry through a demand-pull model, transferring at least three technologies annually; (4) identifies and transfers useful new inventions to the marketplace through a supply-pull model, transferring three to five products annually; (5) delivers training, dissemination and technical assistance programs to stakeholders in the field; (6) is developing an on-line technology transfer course as part of the University at Buffalo's distance education initiative. The dissemination program will include a state of-the-practice conference and the development of a technology transfer program to be offered for presentation in year three. The Center functions as an intermediary and a catalyst, improving the process while expanding the network of stakeholders involved with the field. The end result: new and improved assistive technology products available in the marketplace, to benefit professional service providers, family members and people with disabilities.

NIDRR Project: H133E980024

Start Date: 10/1/98

Length: 60

Funding: FY 98 \$900,000

Principal Investigator

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RERC on Hearing Enhancement

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Research Division
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Text Telephone: (718) 899-3030
Fax: (718) 899-3433
Web: <http://www.hearingresearch.org/>

Abstract

This RERC harnesses emerging technology to accommodate the needs of people with hearing loss, and disseminates related information in a form that is understandable to consumers, service providers, employers, and community leaders. These goals are accomplished by: (1) developing and evaluating improved, cost-effective technological aids for each of the target populations identified; (2) developing and evaluating instrumentation for detecting hearing loss at an early age; (3) providing improved access to modern telecommunications; (4) developing and evaluating specialized technology for community, home, and work environments; and (5) pursuing an active program of dissemination and training to ensure effective utilization of these technological aids.

NIDRR Project: H133E980010
Start Date: 8/1/98
Length: 60
Funding: FY 98 \$900,000

Principal Investigator

Harry Levitt, PhD

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RERC on Communication Enhancement

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Web: <http://aac-rerc.com/>

Abstract

This project uses innovative communications technologies to benefit researchers, engineers, rehabilitation service providers, developers, and users of AAC technologies. The project: (1) investigates attitudinal barriers toward technology use by elderly people with communication disorders, their listeners, and service providers; (2) studies the organizational strategies of adult AAC users to determine if preferences are predictive of performance using AAC; (3) studies how to improve AAC technologies for young children with significant communication disorders by evaluating learning demands and functional performance (also involves development of design specifications); (4) evaluates and enhances communication rate efficiency and effectiveness through the development of procedures and software technology that simulates and measures the performance of AAC technologies; (5) identifies barriers to employment, describes strategies to overcome them, documents design specifications for AAC technologies, and describes action plans to achieve successful employment outcomes; (6) increases employment opportunities for graduates of an employment and AAC program; and (7) develops a coordinated program that monitors and seeks out technology developments in both commercial form and prerelease development stages that affect the engineering and clinical AAC field.

NIDRR Project: H133E980026
Start Date: 11/1/98
Length: 60
Funding: FY 98 \$899,996

Principal Investigator

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Web: <http://www.ski.org/rerc/>

Abstract

This RERC develops and evaluates new technology and methods for infant vision screening, orientation and navigation, described video, access to products, displays and electronic information, deaf-blind communication, and other problems faced by people who are blind, have visual impairments, or have multisensory loss.

NIDRR Project: H133E50001

Start Date: 06/01/95

Length: 60

Funding: FY 95 \$600,000; FY 96 \$600,000; FY 97 \$600,000; FY 98 \$600,000

Principal Investigators

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To their page (leave NARIC site).

Principal Investigator: Gregg C. Vanderheiden, PhD (Trace);

Judy Harkins, PhD (Gallaudet University)

P. I. Phone: 608/263-5788 (Trace); 202/561-5257 (Gallaudet)**Public Contact:** Ben Caldwell**Public Contact Phone:** 608/263-1156**Fax:** 608/262-8848**Project Number:** H133E990006**Start Date:** September 1, 1999**Length:** 60 months**NIDRR Officer:** Richard Johnson, EdD

Abstract: The focus of this Center is to identify telecommunication access barriers in current and future technologies, work with others in the field to identify solution strategies, test them, implement any necessary standards, and assist industry in transferring the ideas into their commercial products. The primary areas of activity of the Center are: (1) research; (2) applied research and development; (3) transfer and technical assistance; and (4) dissemination, education, and outreach. Technologies being addressed include: customer premises equipment (CPE) of all types (phones, video phones, pagers, messaging system, etc.); telecommunication systems and services (voice mail, interactive voice response systems, etc.); network topologies; telecommunications standards; and next-generation multimedia telecommunication systems (telecollaboration, virtual meetings, etc.). The primary focus is on making these systems directly usable by people with all types and degrees of disability. It also includes ensuring compatibility with assistive technologies such as TTY's, assistive listening devices, alternative input devices, and devices with alternative displays.

Descriptors: Assistive technology; Communication; Accessible media

Proposed FY 2000 Information Technology Initiatives

1. Information Technology Technical Assistance & Training Ctr. (funding 2 years of a 5-year project @1.5m/year)	3,000,000
2. Information Technology Demonstration Center	750,000
3. Section 508 Web Site	100,000
4. Web Accessibility Initiative	400,000
5. Procurement Conference	125,000
6. Information Technology and Long-term Mental Illness	50,000
7. Assistive Technology Study	575,000
Total	\$5,000,000

Proposed FY 2001 Information Technology Initiatives

1. Information Technology Technical Assistance & Training Ctr.	
2. Information Technology Demonstration Center	750,000
3. Section 508 Web Site	100,000
4. Web Accessibility Initiative	500,000
5. Information Technology and Long-term Mental Illness	50,000
6. RERC on Access to Emerging Information Technologies for Persons with Disabilities (funding 2 years of a 5-year project)	2,600,000
7. Field Initiated Research Catalyst Program	1,000,000
Total	\$5,000,000

FY 2000 Information Technology Initiatives

Information Technology Technical Assistance and Training Center FY 2000 Funding: \$1,500,000

Project Period: 5 Years

Funding: NIDRR (\$1.5M)

Collaborating agencies: NIDRR with GSA, FCC, and Access Board

Purpose: Develop curriculum and training materials to facilitate the implementation of section 255 of the Telecommunications Act and Section 508 of the Rehabilitation Act.

Stakeholders: Electronic and information technology industry, industrial consortia, professional and trade associations, state procurement officers, product designers and engineers, technical writers, human resource personnel, web developers, consumers and marketers.

Activities:

- Develop and implement a needs assessment survey to determine the technical assistance and training needs relative to section 255, section 508, and universal design;
- Develop and implement relevant training materials and instructional modules that address section 255, section 508, and principles of universal design;
- Provide information, training and technical assistance about section 255 and section 508 to appropriate constituencies;
- Design and implement a web site that contains information and instructional materials that can be used by telecommunications industry and industrial consortia to assist them with implementing section 255 guidelines;
- Identify, implement and evaluate approaches that expand training capacity within the information technology professions;
- Collaborate with GSA and Access Board by contributing information and training materials for the for the Government-wide web site on section 508

Information Technology Demonstration Center

FY 2000 Funding: \$750,000

Project Period: 3 Years with a 2-Year Option

Estimated Joint Funding: NIDRR - \$750K; GSA - \$750K

Collaborating Agencies: NIDRR and GSA

Purpose: Provide forum for industry and consumers to share knowledge about cutting edge IT products.

Stakeholders: Consumers, electronic and information technology industry, industrial consortia, professional and trade associations, Federal and State procurement officers, product designers and engineers, technical writers, employers, small companies, human resource personnel, web developers, marketers, Congressional delegates and staff interested in accessible IT, and consumers.

Activities:

- Provide a physical location for the public to see, touch, try, and compare a wide array of cutting edge IT products;
- Provide a forum for industry to demonstrate their state-of-the-art accessible products and to be a beta test bed for future products including virtual demonstrations of yet to be developed products;
- Provide opportunities for industry to capture consumer feedback through surveys, focus groups, and individual interaction on product(s) lines, design, accessibility features and new prototype products;
- Provide training and technical assistance for a wide array of stakeholders, including small manufacturers, about accessible IT and how to interface new devices with existing systems and assistive technology;
- Disseminate information to public, including industry, about accessible IT and build awareness of a national agenda on accessible IT; build industry capacity in this area; and facilitate trade shows;
- RFP will include an invitation for applicants to partner with or be an industrial consortium.

Section 508 Web Site
FY 2000 Funding: \$100,000

Project Period: 3 Years

Estimated Joint Funding: NIDRR - \$100K; GSA - \$100K; Access Board - \$25K

Collaborating Agencies: NIDRR, with GSA and Access Board

Purpose: To create a web-based source of information on Section 508 and update the information on a regular basis.

Stakeholders: Electronic and information technology industry, industrial consortia, professional and trade associations, Federal and State procurement officers, product designers and engineers, technical writers, employers, human resource personnel, web developers, consumers and marketers.

Background and Activities:

The Access Board reserved the URL "Section 508" last year and is making the URL available for this project. The Access Board, GSA and NIDRR will jointly support the www.Section508 web page. The actual page will be located on one of GSA's servers. Much of the material posted on this web site will be developed by the Access Board, GSA and NIDRR (primarily through out IT TA Center). Other agencies will be able to post, or link to, information provided it is relevant to section 508. Training modules developed by the three agencies will be made available as well as other relevant information such as the proposed Standards, Ed's Questions and Answers, etc.

Web Accessibility Initiative
FY 2000 Funding: \$400,000-\$500,000

Project Period: 5 Years

Collaborating Agencies: NIDRR and possibly NSF, Commerce, DOT – however, they are uncertain at this time

Purpose: To support the W3C to address cross-disability access issues on the web

Stakeholders: Electronic and information technology industry, industrial consortia, professional and trade associations, Federal and State procurement officers, product designers and engineers, technical writers, employers, human resource personnel, web developers, consumers and marketers.

Background and Activities:

- Over the past 2 ½ years the Web Accessibility Initiative (WAI), hosted by the World Wide Web Consortium (W3C), has addressed cross-disability accessibility issues on the Web through a broad range of activities. It has provided a forum where numerous organizations internationally have combined their efforts toward improved accessibility of the Web. The W3C is primarily an industry consortium with over 400 Member organizations, hosted at MIT's Laboratory for Computing Sciences, the Institute National de Recherche en Informatique et en Automatique (INRIA) in France, and the Keio University in Japan. Continued support of this program will enable WAI to:
 - Develop advanced versions of WAI guidelines and techniques to cover advanced Web technologies such as XML applications;
 - Develop a superset of universal design guidelines by integrating device-independence, internationalization, and usability with accessibility considerations;
 - Track accessibility issues in 25 or more W3C specifications through all stages of development;
 - Document techniques for accessibility features of W3C specifications in appendices and example code;
 - Expand techniques for retrofitting and validating conformance with WAI guidelines;
 - Develop resource packages for accessibility of E-Commerce and distance learning;

- Provide in-house technical assistance to industry on design of accessible Web sites and software;
- Monitor and provide liaison to research and development projects which affect future Web accessibility; and
- Provide technical assistance to research projects to promote adoption of universal design approaches in development of new Web technologies.

Procurement Conference
FY 2000 Funding: \$125,000

Project Period: 1 Year

Estimated Joint Funding: GSA - \$125K; Access Board - \$25K

Collaborating Agencies: NIDRR with GSA and Access Board

Stakeholders: Federal and State Procurement Officers

Purpose: To educate relevant personnel on complying with Section 508

Background and Activities:

Federal and State Procurement Officers lack knowledge about section 508 and how to interpret/comply with 508 Standards. This project will provide information about training to increase awareness and competence.

Information Technology and Long-term Mental Illness
FY 2000 Funding: \$50,000

Project Period: 5 years

Estimated Joint Funding:

Collaborating Agencies: NIDRR with SAMHSA/CMHS

Purpose: To investigate the application of information technology in the rehabilitation of individuals with long-term mental illness

Stakeholders: Consumers and family members, mental health professionals, community-based rehabilitation agencies

Activities:

The overall RRTC will assess self-determination as a strategy in assisting persons with LTMI to live independent and productive lives in the community. The IT project will study the uses of IT in providing supports and services, information, peer communications, and self-management.

Assistive Technology Study
FY 2000 Funding: \$575,000

Agency: NIDRR

Project Period: 15 months

Purpose: To conduct an assessment of Information Technology and assistive technology use and unmet needs, an analysis of the infrastructure and delivery systems, and the role of universal design in improving access to information technology/assistive technology

Stakeholders: Consumers, State Tech Act agencies, designers and suppliers of IT/AT, and others.

FY 2001 Information Technology Initiative

RERC on Accessible Wireless Information Technology

FY 2001 Funding: \$1,300,000

Agency: NIDRR

Project Period: 60 months

Purpose: To conduct research and development to address accessibility of wireless IT and new applications of wireless IT to improve the lives of individuals with disabilities in the areas of work, health maintenance, and living independently in the community.

Stakeholder: IT industrial consortia and institutions of higher education are likely applicants.

Background and Activities:

Wireless information technology is the next wave in the information technology (IT) revolution that has swept through the society. As with other aspects of IT, wireless systems have immense potential to improve the lives of people with disabilities, but only if accessibility of the technology is maintained. This RERC will be charged with monitoring rapidly evolving wireless technology to ensure accessibility and to develop new applications of the technology that cut across the NIDRR Long Range Plan.

Combinations of microcomputer and wireless telecommunication systems have the potential to significantly enhance mobility, employment, health and function, and independence by making information, assistive services, and control and sensing systems available in any place, at any time. By developing these systems for the widest range of functional ability (physical, cognitive and sensory), the utility of these new applications will benefit all members of society. The RERC will be established to solve specific problems associated with areas of the Long Range Plan, but will be required to implement management methods to effectively accommodate the anticipated rapid changes in technology.

This RERC will be charged with developing new capacity in science, engineering and technology to realize the benefits of new IT developments for people with disabilities. Given the already large demands for new professionals in this area, it will be critical to enhance education and training opportunities for people with disabilities to fill this need.

Field Initiated Research Catalyst Program
FY 2001 Funding: \$1,000,000

Agency: NIDRR

Project Period: 36 months

Purpose: To provide incentives and support for accessible technology development by industry and academia.

Activities: Investigators will propose research that they consider to be cutting edge approaches to address the needs for accessible IT.

The plan is to make 4-5 awards of \$200-250K per year for three years.

National Institute on Disability and Rehabilitation Research
Katherine D. Seelman, Ph.D.
Director

NIDRR FY2001 BUDGET REQUEST - \$100 million

1. Approximately: 70 percent would be used for CONTINUATIONS
26 percent for NEW GRANTS
4 percent for CONTRACTS
2. Increase of \$13.538 million, or 15.7 percent, above the fiscal year 2000 appropriation.
3. Increase = Technology initiatives:

\$5 million for an Educational Technology Initiative
\$8.5 million for a Technology for Independence Initiative
4. \$5 million Educational Technology Initiative: To provide technical assistance and training regarding accessible information technology, statutory requirements and technology standards, and resources available to schools serving students with disabilities.
5. \$8.5 million Technology for Independence Initiative: Two Parts

Part I: \$3.1 million for an Employment initiative to carry out research, training, and technical assistance to enhance the ability of individuals with disabilities to access and use information and communication technology to increase employment opportunities, including self-employment.

Part II: \$5.4 million for a Community Independence initiative to enhance community independence of individuals with disabilities through innovative applications of information and assistive technology.
6. NEW GRANT awards that are part of the Technology Initiative
 - 2 RERCs: (1) cognitive disabilities; (2) transportation
 - 5+ PROJECTS: (1) increasing employment opportunities
(2) abandonment of assistive technology
(3) wayfinding
(4) measuring the impact of technology
(5) community-based research on accommodation and AT

National Institute on Disability and Rehabilitation Research
Katherine D. Seelman, Ph.D.
Director

NIDRR's Educational Technology Initiative - \$5,000,000

ISSUE: What is OSERS doing to assist schools and universities to ensure that their educational technology resources are accessible to students with disabilities?

BACKGROUND: Educational entities are relying more and more on computer technologies and the Internet. Too often it is the case that schools purchase and use information technologies that are not accessible to students with disabilities. Access to these technologies is critical to the educational performance of children, youth, and adults with disabilities.

COMMENTS: . The purpose of NIDRR's Educational Technology initiative is to provide technical assistance to schools and other educational agencies on how to evaluate and procure accessible information technology suitable for persons with disabilities.

The Educational Technology Initiative would capitalize on the information dissemination expertise and networks of the Disability and Business Technical Assistance Centers (DBTACs), assistive technology expertise of the Assistive Technology Act (AT) grantees, and technical expertise of relevant Rehabilitation Engineering and Research Centers (RERCs).

The grantees will:

1. form regional partnerships among the DBTACs, AT grantees, RERCs, Office of Special Education Program technology grantees, and pertinent educational organizations and agencies;
2. provide technical assistance and training to educators, parent networks, school boards, and universities about accessible information technology and access to information technologies;
3. provide technical assistance and training on Section 504 and Section 508 of the Rehabilitation Act, Section 255 of the Telecommunications Act, and the Americans with Disabilities Act; and
4. provide technical assistance and training about procurement policies related to information technology; develop information packets and training materials; and conduct evaluations of school environments and information access at educational entities.

KEY CONTACT: David Esquith (205-8801)

National Institute on Disability and Rehabilitation Research
Katherine D. Seelman, Ph.D.
Director

NIDRR's Technology for Independence Initiative - \$8,500,000

ISSUE: What is OSERS doing to take advantage of the information technology revolution to improve the employment status of persons with disabilities and enable them to live more independently in the community?

BACKGROUND: In an increasingly technological world, individuals with disabilities encounter numerous difficulties in accessing mainstream products and systems, including workplace information technology. In addition, the pace of developments in the field can render personal assistive technologies obsolete in a relatively short period of time. These problems contribute to the approximately 70 percent unemployment rate of people with severe disabilities.

COMMENT: The Technology for Independence Initiative will address the technological needs of disabled people to live, learn and work in an increasingly technological environment, as well as enhancing the capability of industry and government to make the technological infrastructure more accessible to disabled people. The Technology for Independence Initiative will bring together basic science, applied rehabilitation science, and engineering research with industry and the end user to identify and solve technological problems that pose obstacles for individuals with disabilities to reap the full benefits of the new economy.

The Technology for Independence initiative is organized into two parts: Employment and Community Independence

Employment - \$3.1 Million

The purpose of the employment component of the Technology for Independence Initiative is to carry out research, develop the tools, and provide technical assistance and training necessary to enhance the ability of people with disabilities to access and use information and communication technology in the workplace.

The grantees will:

1. conduct research and provide training and technical assistance to assist persons with disabilities to access and use the full range of available information technology, including, but not limited to the Internet, computers, and telecommunications;
2. conduct research on the successful use of technology by people with cognitive and learning disabilities in order to improve their employment status;

3. identify, develop, and evaluate strategies for promoting adoption of universal design in the building, communications, transportation, and product manufacturing industries.
4. sponsor joint workshops among the Technology, Medical, and Statistical subcommittees of the ICDR and provide support for interagency research, data collection, and data analysis.

Community Independence - \$5.4 million

The purpose of the community independence component of the Technology for Independence Initiative is to carry out research, develop the tools, and provide technical assistance and training necessary to enhance the community integration of people with disabilities through the use of information and assistive technology at both the individual and systems level and across the lifespan of an individual. The grantees will:

1. measure the extent to which new technologies are successful in enabling people to function more effectively in their physical and social environments;
2. conduct research on community-based issues in public accommodation and assistive technology in order to enhance community integration and participation for people with disabilities of all ages;
3. analyze the “when, how, what, why, and who” related to abandonment of technology by users with disabilities;
4. develop new technology to address the needs of children who depend on orthotic devices for mobility and other functions, taking growth and development issues into consideration.
5. develop and evaluate emerging technologies affecting families with disabilities, as well as provide families with the information and technical assistance they need to use and maintain these technologies;
6. develop technology that would ensure the safety and integration of wheeled mobility devices and public and private transportation vehicles for people with mobility disabilities;
7. conduct research on technology that could be used to improve the ability of individuals who are blind and visually impaired to move from place to place independently; and
8. evaluate and develop emerging transportation technologies specific to persons with low vision and transportation technology issues affecting elderly persons with disabilities.

KEY CONTACT: Bill Peterson (205-9192)

Preliminary Proposal for WAI Phase II Program

March 8, 2000

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Executive Summary

This preliminary proposal outlines Phase II activities for the Web Accessibility Initiative (WAI), a project hosted by the World Wide Web Consortium (W3C) addressing accessibility of the World Wide Web for people with disabilities.

Two levels of funding are outlined: a maintenance level of \$1,933,971 over a five year period which would enable WAI to continue its work, and an expansion level of \$3,591,660 over a five year period. The expansion level would enable WAI to increase outreach activities and technical assistance supporting implementation by Web developers, and to address a broader range of accessibility issues among the rapidly proliferating technologies of the Web.

Introduction

Web accessibility, for tens of millions of Americans with visual, hearing, physical or cognitive disabilities, provides the key to the information society: to the on-line commercial world, educational opportunities, employment opportunities and workplace communication; voting; government services; recreation, and more.

Over the past two and a half years, the Web Accessibility Initiative (WAI), hosted by the World Wide Web Consortium (W3C), has addressed cross-disability accessibility issues on the Web through a broad range of activities. It has provided a forum where scores of organizations internationally have combined their efforts toward improved accessibility of the Web.

The W3C is primarily an industry consortium with over 400 Member organizations, hosted at MIT's Laboratory for Computing Sciences, at INRIA (Institut National de Recherche en Informatique et en Automatique) in France, and at Keio University in Japan. It is directed by Tim Berners-Lee, inventor of the Web.

This preliminary proposal highlights accomplishments during WAI Phase I; identifies challenges faced by WAI during Phase I and expected in Phase II; and outlines maintenance and expanded levels of activity for WAI Phase II.

Accomplishments

WAI Phase I work has led to extensive accomplishments in Web accessibility over the past two and a half years. These accomplishments have occurred within a context that remains a unique model: a vendor-neutral, international setting in which industry, disability representatives, accessibility researchers and government representatives work together on a consensus basis to ensure accessibility of a vital mainstream technology.

During this period W3C's Web Accessibility Initiative has:

- ❑ Ensured support for accessibility in W3C Recommendations for new Web technologies: HTML 4.0, CSS2, MathML, SMIL 1.0, DOM 2, SVG 1.0, XHTML 1.0, Micropayment Markup, and Ruby Annotation.
- ❑ Published two guidelines as W3C Recommendations -- Web Content Accessibility Guidelines 1.0 and Authoring Tool Accessibility Guidelines 1.0 -- and advanced the User Agent Accessibility Guidelines 1.0 to Candidate Recommendation status.
- ❑ Published technical references as W3C Notes: Techniques for Web Content Accessibility Guidelines; Techniques for Authoring Tool Accessibility Guidelines; Accessibility Features of SMIL; and Accessibility Features of CSS.
- ❑ Assisted in developing a variety of tools to check and repair accessibility of Web pages.
- ❑ Produced a variety of promotion and training materials, including on-line curriculum, video, flyers, reference cards, policy links, alternative browser resource links; disseminated over 80,000 "Quick Tips to Make Accessible Web Sites" reference cards; and conducted over 60 presentations and trainings in 16 countries.

WAI's work has contributed to the following outcomes:

- ❑ Establishment of WAI as the central forum enabling industry, disability organizations, access researchers and government representatives to jointly develop consensus-based solutions for Web accessibility; and as an international coordination point for Web accessibility efforts and sharing of resources.
- ❑ Availability of authoritative, consensus-based Web accessibility guidelines backed by the credibility of the World Wide Web Consortium, and already referenced by several national governments.
- ❑ Greater public awareness of Web accessibility nationally and internationally, and increased implementation of Web Content Accessibility Guidelines on Web sites.
- ❑ Commitments by many software developers to implement the Authoring Tool Accessibility Guidelines and User Agent Accessibility Guidelines in future product releases.
- ❑ Awareness of Web accessibility issues throughout W3C's 400 Member organizations and related consortia.

Need

Prior to the start of WAI Phase I, key needs identified in the WAI Briefing Package included:

- ❑ Establish a central point for setting accessibility goals for the Web.
- ❑ Act as an advocate for people with disabilities to the Web development community.
- ❑ Act as advocate for people with disabilities.

In meeting these goals during WAI Phase I, challenges included:

- ❑ Bringing diverse players (industry, disability, research, government) together into an internationally coordinated effort, in order to forestall fragmentation of guidelines;
- ❑ Developing a continuum of shorter-term solutions (guidelines for accessible Web content, and tools to transform or retrofit inaccessible Web content) and longer-term solutions (guidelines for Web software, and support for accessibility in new Web technologies);
- ❑ Developing unified, comprehensive guidelines for Web accessibility, addressing backwards and forwards-compatibility with evolving Web technologies;
- ❑ Integrating efforts tightly within the Web industry to ensure quality of accessibility Recommendations and to promote industry implementation.

Additional challenges emerged during WAI Phase I:

- ❑ Rapid proliferation of new Web technologies (XML, SMIL, SVG, DOM, RDF, etc.) with the resulting need to track over 30 different technologies under development, as opposed to the originally expected four or five;
- ❑ Rapid proliferation of parallel industry consortia in the Web marketplace, and a corresponding expansion of standards discussion (Mobile phone, TV, Web 3D, Electronic books, etc.) with the resulting need to provide liaison to prevent fragmentation of accessibility approaches.

During WAI Phase II these challenges will continue. The majority of new Web technologies hold the possibility of creating new barriers to Web accessibility if dialog is not begun early and maintained throughout the development process. In addition, the unprecedented popularity of the Web means an ever-increasing audience of Web designers to reach through a variety of awareness and training approaches. Focused attention is needed in the areas of XML, multimedia, vector graphics, voice browsing, as well as application areas such as distance learning and electronic commerce. WAI has established an excellent foundation and credibility from which to address these challenges.

Funding

During WAI Phase I, combined support from the US National Science Foundation (NSF) and the Department of Education's National Institute on Disability and Rehabilitation Research (NIDRR) was administered as a Cooperative Agreement between NSF and MIT's Laboratory for Computer Science and formed the core of WAI funding. Funding levels through the Cooperative Agreement were \$300,000 in year one, \$316,000 in year two, and \$333,000 in year three.

This core support from the US Government enabled the leveraging of additional resources for WAI activities at W3C: governmental funding from the European Commission and the Government of Canada; major industry support from IBM/Lotus, Microsoft, and Bell Atlantic; and contributions from organizations including NCR, WinWriters, and Massachusetts Association for the Blind. These additional resources averaged \$300,000 per year.

WAI's positioning within W3C enabled it to draw extensively on the valuable expertise of W3C staff – in some cases the leading experts on particular Web technologies – and on W3C visiting scientists sponsored by individual W3C Member organizations (Hewlett-Packard and Helsinki Telephone Corporation in the case of WAI activities).

Further in-kind support leveraged by WAI Phase I included extensive participation from over fifty Member & non-Member organizations from around the world contributing regularly to WAI's eight working groups and interest groups. While participation of organizations in W3C/WAI is fluid over time, to roughly estimate the value of this contribution: with an average of seven organizations contributing one or more FTE (full-time equivalent) annually, an average of twenty organizations contributing at least .25 FTE annually, and approximately forty organizations contributing at least .05 FTE annually, this leveraged contribution of non-staff resources to WAI activities has risen to over \$1,000,000 by the third year of WAI Phase I.

For WAI Phase II, two levels of activity are proposed in the following section. Maintenance of current effort would require core US support administered through MIT's Laboratory for Computer Science at \$350,000 in year one through \$425,000 in year five, for a total of \$1,933,971 for a five year period. An expanded level of effort to meet the expanded needs for Web accessibility would require core US support at \$650,000 in year one through \$790,000 in year five, for a total of \$3,591,660 for a five year period.

Both the maintenance and expanded activities proposed for WAI Phase II presume continued leveraging of additional resources – from other national governments, industry sponsorships, and in-kind participation – at similar rates as during WAI Phase I, in order to carry out these activities.

Proposed Activities

The proposed program for WAI Phase II includes a range of complementary activities at more advanced levels in the areas of technology, guidelines, tools, education/outreach, and research and development. The proposed activities maximize the collaborative environment and promotion opportunities within W3C.

The proposed program below is a preliminary outline only, and presumes continued leveraging of other funds and in-kind resources. Some activities in the proposed program below are marked "[Expanded effort]" – as explained in the "Funding" section above, these activities represent proposed WAI Phase II work at an expanded level of funding.

1. Technology
 - 1.1. Track accessibility issues in 25 or more W3C specifications through all stages of development: Charter, Requirements, Working Drafts, Last Call, Candidate Recommendation, Proposed Recommendation, Recommendation.
 - 1.2. Negotiate consensus approaches to accessibility issues in W3C specifications.
 - 1.3. Document techniques for accessibility features of W3C specifications in appendices and example code, and through separate WAI technical reference notes.
 - 1.4. [Expanded effort] Track accessibility issues in external consortia: XML applications in Oasis; WML in Wireless Access Protocol Forum; VRML; Open E-Book; etc.
2. Guidelines
 - 2.1. Analyze implementation patterns for existing WAI guidelines, and deployment trends of new Web technologies potentially requiring new guidelines or techniques modules.
 - 2.2. Expand techniques documents providing implementation support on WAI guidelines for Web site designers and Web software developers.

- 2.3. Develop advanced versions of WAI guidelines and techniques to cover advanced Web technologies such as XML applications.
- 2.4. [Expanded effort] Develop a superset of universal design guidelines by integrating device-independence, internationalization, and usability with accessibility considerations.
3. Software (Tools)
 - 3.1. Expand techniques document for retrofitting and validation functions of tools facilitating conformance to WAI guidelines.
 - 3.2. [Expanded effort] Develop modular open-source plug-ins for adoption by authoring tool developers to support accessible authoring practices (prompting, alerts, help files, etc.) in commercial tools.
 - 3.3. [Expanded effort] Develop prototype accessible implementations of new W3C technologies to encourage commercial implementations in Web software.
4. Education and Outreach
 - 4.1. Expand on-line curricula, general and technical reference documents, galleries showcasing model Web sites and tutorial sites, hard copy promotional materials, and other re-usable technical assistance materials.
 - 4.2. Develop resource packages for key areas such as accessibility of E-Commerce and distance learning.
 - 4.3. Conduct public presentations and workshops to promote awareness and provide training on Web accessibility among Web designers and software developers.
 - 4.4. Conduct promotion campaigns through a variety of media to reach Web designers, Web software developers, users, and the public.
 - 4.5. [Expanded effort] Provide in-house technical assistance to industry on design of accessible Web sites and software.
 - 4.6. [Expanded effort] Provide liaison to external consortia to advise on Web accessibility and to promote harmonization of Web accessibility standards.
5. Research and Development
 - 5.1. Monitor and provide liaison to research and development projects which affect future Web accessibility.
 - 5.2. [Expanded effort] Co-host symposia on universal design approaches to Web-related research and development.
 - 5.3. [Expanded effort] Provide technical assistance to research projects to promote adoption of universal design approaches to development of new Web technologies.

Contact

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W3C/WAI References

1. Web Accessibility Initiative home page: <http://www.w3.org/WAI>
2. World Wide Web Consortium home page: <http://www.w3.org/>
3. W3C Technical Reports (lists all W3C specifications mentioned in this document):
<http://www.w3.org/TR>
4. "Web Content Accessibility Guidelines 1.0," W. Chisholm, G. Vanderheiden, and I. Jacobs, eds., W3C Recommendation 5 May 1999: <http://www.w3.org/TR/WCAG>
5. "Authoring Tool Accessibility Guidelines 1.0," J. Treviranus, C. McCathieNeville, I. Jacobs, J. Richards, W3C Recommendation 3 February 2000: <http://www.w3.org/TR/ATAG>
6. "User Agent Accessibility Guidelines 1.0," J. Gunderson, I. Jacobs, W3C Candidate Recommendation 28 January 2000: <http://www.w3.org/TR/UAAG>
7. "Techniques for Web Content Accessibility Guidelines 1.0," W. Chisholm, G. Vanderheiden, and I. Jacobs, eds. W3C Note 5 May 1999: <http://www.w3.org/TR/WCAG10-TECHS/>.
8. "Techniques for Authoring Tool Accessibility Guidelines 1.0," J. Treviranus, J. Richards, I. Jacobs, and C. McCathieNeville eds. W3C 3 February 2000:
<http://www.w3.org/TR/ATAG10-TECHS>.
9. "Accessibility Features of SMIL," M.R. Koivunen, I. Jacobs, W3C Note 21 September 1999:
<http://www.w3.org/TR/SMIL-access>
10. "Accessibility Features of CSS," I. Jacobs, J. Brewer, W3C Note 4 August 1999:
<http://www.w3.org/TR/CSS-access>
11. "Techniques for User Agent Accessibility Guidelines 1.0," J. Gunderson, and I. Jacobs, eds.:
<http://www.w3.org/TR/UAAG10-TECHS/>.
12. "Overview Presentation on Web Accessibility Initiative," J. Brewer:
<http://www.w3.org/Talks/WAI-Intro>
13. "Curriculum for Web Content Accessibility Guidelines," C. Letourneau, G. Freed:
<http://www.w3.org/WAI/wcag-curric/>
14. "Quick Tips for Accessible Web sites," W3C/WAI Education and Outreach Working Group:
<http://www.w3.org/WAI/References/QuickTips>
15. "Fact Sheet for Web Content Accessibility Guidelines 1.0,"
<http://www.w3.org/1999/05/WCAG-REC-fact>
16. "Fact Sheet for Authoring Tool Accessibility 1.0," <http://www.w3.org/2000/02/ATAG-FAQ>
17. "Policies Related to Web Accessibility," J. Brewer:
<http://www.w3.org/WAI/References/Policy>
18. "Alternative Web Browsing," P. Boshier: <http://www.w3.org/WAI/References/Browsing>
19. "Evaluation and Repair Tools," W. Chisholm, D. Dardailler:
<http://www.w3.org/WAI/ER/existingtools>
20. "Web Accessibility Report Tool," D. Dardailler: <http://www.w3.org/WAI/report/>
21. "Briefing Package for Project Web Accessibility Initiative," D. Dardailler, February 1997:
<http://www.w3.org:80/WAI/References/access-brief.html>