

Carol - This is the disability community's preliminary outline -- we expect them to reduce its comprehension.

~~CONFIDENTIAL~~ TALKING POINTS RE: CCD WHITE HOUSE MEETING 8/4/94

The second document is a distillation of industry perspectives. Perhaps scan pp. 3-4 for its gist. Stan

SUMMARY

I. INTRODUCTION OF DISABILITY PERSPECTIVE

UNIVERSAL DESIGN CONCEPT

- A. Economics of special equipment
- B. Building in Accessibility
- C. Disability Is Not a Way to Categorize People
- D. Individuals with Disabilities are Part of Community
- E. Employment/Unemployment
- F. Development of Standards

II. INTEGRATION OF CONCEPT THROUGH ADMINISTRATION

- A. Resource Persons for FCC and NTIA
- B. ITTF take up Universal Design Concept
- C. NIST Take Up Universal Design Concept
- D. Universal Design Mandate in NII Development
- E. NSTC Take Up Universal Design
- F. NIDDR Take Up Universal Design in RECs and other Initiatives.

III. NEED FOR INTEGRATED FEDERAL PRESENCE

IV. EXAMPLES OF WHERE STATUTE AND REGULATIONS FAIL THE COMMUNITY

- A. Federal enforcement of Section 508 of the Rehabilitation Act
- B. Current problem: MOSAIC/Graphical User Interfaces.
- C. Speech integration. ADA Title IV.
- E. RFP process, grantmaking

V. CURRENT LEGISLATIVE & REGULATORY ISSUES

- A. "Going Beyond the Bells"
- B. FCC Implementation
- C. Redefining Universal Access/Service
- D. CCD and Advocacy Role

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8-3-94

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UNOFFICIAL DOCUMENT:

THIS PAPER DOES NOT REFLECT THE VIEWS OF THE ADMINISTRATION, INDUSTRY OR ANY ONE FIRM. IT IS A DISTILLATION OF INTERVIEWS OF INDIVIDUALS WHO WORK TO PROMOTE ACCESSIBILITY WITHIN THEIR FIRMS.

By Steven Saleh

BACKGROUND

To be accessible to individuals with disabilities, the National Information Infrastructure, here must be a common data protocol at each stage of the information chain, a term defined as accessible interoperability. Audiotext and videotext information must flow unhindered through five types of players responsible for completing the digital loop.

Player	Example
1. Information Producer	Touchstone Pictures
2. Information Provider	Disney Channel
3. Information Transporter	cable, satellite, wireless, telephone wire infrastructure
4. Network Access Provider	Delphi, America On Line
5. Customer Premise Equipment	Television, Computer, Set-Top Box

At each of these steps the data protocol may require changes to be existing hardware and software, and new design elements need to be considered in the next generation of products. The greatest challenges an individual with a disability faces is interaction with the end user interface of equipment and software. It is there that the researcher focused most of his attention.

Customer Premise Equipment

Firms competing in the software/electronic appliance industries make decisions based on profitability, competitive advantage, and risk.

1. Firms decide to develop new features based on factors such as market size, and ability to complete product design with limited time and financial resources.
2. Though the disabled population is large, the audience size for features to address specific disabilities is smaller than other, more broad based features. Company

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strategy on this issue varies substantially. With an aging population, market potential for disability features is expected to increase. Most companies have yet to adapt the framework of universal design. Under this paradigm of business decision making, increasing accessibility to the community of individuals with disabilities also makes the products more accessible to able-bodied people.

3. Since the marketplace is extremely competitive as is the demand for new features, accessibility features have difficulty getting high or any priority within companies. Historically, the most effective way in raising priority is through legislation and regulation.

However, regulatory requirements must meet three goals. They must be broad enough to apply to current diverse technologies, effective enough to insure truly usable accessibility, yet flexible enough to not hinder the development of new technologies and applications.

When all players are required to develop features that meet user accessibility requirements, the chance of any one firm losing some degree of competitive advantage on other features is minimized.

4. Many areas of industry lack experience and expertise to define and implement accessibility features for their technologies. This is due in part to the absence of a sophisticated demographic ergonomic database available to industry. Other groups in industry, government, and the disability community have a level of expertise. Information sharing mechanisms are lacking and need to be developed.

Industry would benefit from the availability of independent testing organizations who could evaluate the accessibility of products under development. This would allow manufacturers to pinpoint specific improvements without the need to become experts in assistive technology.

5. All stakeholders must recognize that the standards needed to define levels of accessibility for new appliances are needed today and not 24 months from now. Steps need to be taken to speed up the process of developing standards.
6. All appliances need to have some capability to interface with people with disabilities. Currently, some appliances such as computers are at least partially configurable, but may be placed in settings where the user is prevented from configuring them. Many appliances such as ATM's are not configurable, so it is even more important to build a level of accessibility into them during manufacture.

MOTIVATIONS FOR DEVELOPMENT OF ACCESSIBILITY FEATURES

Governments's strongest influences in achieving accessibility to date has been

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availability of government research funding and legislation. Sources of research on human factors include NIDRR, and to a lesser extent, NSF.

- 1. Section 508 has historically been ineffective in motivating industry to build in accessibility features due to its spotty application and enforcement. Only in recent years have federal agencies begun including specific accessibility requirements in RFP's, and thus created the possibility of real financial risks for non-compliant companies. However, Section 508 only affects firms who sell to the government, especially in large quantities.

COCA has made substantial progress in defining language that includes coverage for most disabilities. However, there is concern that the goals of 508 will be eliminated in the process of reinventing government.

- 2. To date the American with Disabilities Act has been ineffective in insuring access to electronic appliances. This is because there is no specific coverage of electronic information systems in existing federal access guidelines. These guidelines have been the responsibility of the Access Board, technically known as the Architecture and Transportation Barriers Compliance Board.
- 3. The threat of loss of government business combined with the risks of breaking well enforced laws are strong drivers that would be effective in influencing the decision process of what features will be allocated resources.
- 4. Developing accessibility features is not considered a high profile job within the design culture, both within the companies and in the trade press. It is critical that steps are taken to recognize accessibility achievements. This could be another effective tool at raising the priority of these features.

SPEEDING UP THE PROCESS

To significantly speed up the process of developing accessibility features in new appliances, such as the set-top box, as well as existing appliances such as the computer, the following steps should be considered:

- 1. Develop standards from a user perspective on what makes an appliance accessible. This includes an demographic ergonomic database that helps define levels of accessibility
- 2. Establish target dates with associated levels of accessibility.
- 3. Insure that construction of accessibility features do not limit the development of creative technology.

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4. Consider the implementation of a joint stakeholders working group on accessibility features and the NII. The stakeholders would include industry, government, and representatives from the disability community.
5. Allocate R&D for the development of user accessibility standards of accessibility that can be adapted by industry. This is especially critical for emerging technologies such as animated, verbal, three dimension and virtual reality.
6. Detail the benefits and drawbacks of strategies to finance the cost of developing accessibility features. Possible strategies include: 1) passing cost to all consumers, 2) subsidy by the government, 3) passing costs on by the consumer who has disabilities or 4) funding by vendors themselves.
7. Address problems where existing copyright laws restrict the development of close captioning, translations, descriptive video, or simplified user interfaces for pre-existing materials.

F

SUB:
American
Infrastructure

DATE: August 3rd

Time and Place: 2:00 to 4:00 p.m., Thursday, Aug, 4, 1994
Room change to NEOB 5104

Point of Contact:

David Lytel: x66037. He is an information infrastructure specialist in the Office of Science & Technology Policy.

Audience:

Some 38 participants are expected. They are mainly representatives of various disability organizations, with a few industry representatives, and federal officials. There will also be some signers and personal assistants.

Deborah Kaplan, Vice-President of the World Institute on Disability, and a member of our NII advisory group, is likely to be a vocal participant. You may recall that she was one of the speakers at the Annenberg Washington Program.

Session:

You will open the meeting, offering brief remarks of welcome and inviting folks to introduce themselves. For an overview of the meeting structure, see Appendix A.

Suggested welcoming remarks:

1. We are delighted to welcome you to the White House and to host this meeting on Americans with disabilities and the National Information Infrastructure. We see this ^{meeting} as a chance to learn more about how the NII can be improved so that all Americans can be full participants.

^{Exciting}
2. This meeting is a natural extension of the wonderful gathering on the South Lawn last week when over 3300 people came to celebrate the fourth anniversary of the Americans with Disabilities Act. The President ^{felt us} choose that day to also ^{also} highlight one of the great accomplishments of the ADA by using the telephone relay system to speak with Dr. Glenn Anderson. Dr. Anderson, the new chairman of the Board of Trustees of Gallaudet University, informed him that "the ADA is working very well" ^{reminded the President} would work even better in the years to come, and that their conversation was "a living example of how well the ADA is working."

^{Exciting like we need more help + all from -- my son --}
3. The Administration understands the important role of technology in including people with disabilities in every aspect of society. I chair a series of meetings with the Administration's appointees with disabilities and can assure you that the issues of accessibility, the ADA, and assistive

Learn fact
Kenny

technology has come before our group. And those issues will likely be revisited in the months to come.]

4. The President's strong belief that we have not "a single person to waste" is important to keep in mind as we design the information superhighway. As President Clinton emphasized at the ADA anniversary event, that commitment to every person is "why we are here to rededicate ourselves to an America where every man, woman and child can reach the fullest of their God-given potential.

5. As planning for the National Information Infrastructure moves forward, the Clinton Administration recognizes the importance of the concept of universal design and the diverse needs of all our people. *absent*

6. I look forward to learning from your expertise, and now invite you to go around the room and briefly introduce yourselves.

Other appendices:

- App. B Letter of invitation from Sally Katzen and Larry Irving
- App. C List of invitees.
- App. D Transcript of President Clinton's telephone relay call to Dr. Glenn Anderson

Lang Irving --

Mike Nelson -- ASTEP

David Lyell --

Mechanical Arts

Assistant

Eddie Espinoza - spec work to Coulter

Paul Herne

Don Halkley - ASTEP lessons

Karen Banner - U of Delaware (A.I. Report)

Domen Sartin

Al Summitt -- Dept of Energy

Frank Bone

Toby Silver - spec work for Boston

Telecommunications

Reborah Kaplan -- MIT working on

Paul Schneider -- ASD

Greg Vandenberg UWisc.

Tember Surpin -- UCP

Lang Skadden USCFD -- tech project re applications

Steve Selah -- volunteer at ASTEP

Sally Katze -- info/proj affairs

Info Policy Comm

NEI Task Force

Jim Keegan -- FCC

Jim Tobias

Greg Lowrey

Neil Scott -- Unresearch design

Alan Dymally

E.A. Richmond: Alan Brightman --

Ernest Richmond, Larry Gubler -- national access panel
Special Space Comm. BLK/DMN

Bruce McLeod
COMB
Roman Roberts
chairman

To: Stan Herr, Bruce McConnell, Roanne Robinson
From: David Lytel, Susan Brummel, Kate Seelman
Re: Overview of mtg with Disability Community 4 Aug in VPs Ceremonial Office 2:00-4:00
Date: 22 July 1994

Here is what we have come up with. I don't think we need to have a meeting for you to brief your principals, but we can have one if anyone wants one...

2:00 Welcome: Carol Rasco

One of a series of meetings to better understand the needs of Americans with disabilities, this one focused upon improvements in the NII and the full participation of all Americans. Even if we do not know precisely how the NII will develop we know it must be accessible to everyone. The question before us is how to accomplish that.

2:05 Carol invites everyone to introduce themselves

2:15 The NII Initiative: Sally Katzen and Larry Irving

What is the NII; how the IITF is organized; what we have done to make information more accessible; hearings on universal service and NII grants program; next set of applications papers to be released in September include one on Americans with Disabilities and the NII.

Legal accessibility
by telephone
Survey: - Tech change parity
Broad concept - Access to 5 hearing
Doing well with
doing so
35 Mil R/P
750 mil DB around world

2:30 Leading government programs advancing inclusion: Kate Seelman

National Institute on Disability and Rehabilitation Research (NIDRR) in the Department of Education; Clearinghouse on Computer Accomodation at GSA; Administration on Developmental Disabilities in HHS; NSF program; handout of one-page program descriptions.

2:35 Overview of major disability community concerns: Debra Kaplan

[They will do this, to include consciousness raising for IITF and other officials, pending legislation, regulatory activities, enforcement, funding, etc.]

Thrilled
Impressed at your
words, Larry
willing to engage
Keep it up, thanks to Debra
Make this party - fun issue

2:45 Open discussion: Kate Seelman, moderator

Universal design -> cheaper -> Tech for everyone so we
Friendly and economies of scale (not technical; want guidelines
Performance standards for
Industry
NII AWAC
Protocol for access

3:50 Summary and concluding remarks: Larry Irving

Distribution of "Putting the Information Infrastructure to Work Volume I"

Deborah

Frank Bowe -- low intellectual demands
network does complicated things

physical

switch in front
Fibre

conveys voice to test
signing -- over the phone

Gordon Richardson --

Paul Schroeder: see hashing (ccs)
Les. helps to set expectations

van der Hilt

Rehab Net \$500 -- regulatory accumulation
in Fed Govt -- but not
evidenced in RSP

Skardon -- wants to cut RSP
piece of legislation using
terms like "universal design"
(+ long long)

Hearno: what should happen then?

HB 3626 passed by House Com.

cavents: no undue burden
no adverse effect on comp.

"accessible to, and usable by"

DwD -- need mandate "no out"
1. no mandatory access in log
2. FCC reqs - (consultants reports)
3.

slow progress
?? Q: title III "30 months effective date"
retrofitting

J. Tobias: ?? Bell Lab -- specific guidelines

Common in order market?
what is real market?
200 Bth disposal income of pp.
variable?
1120 market place

App. B

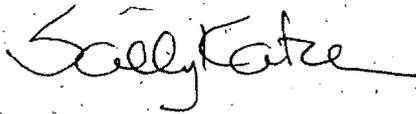
THE WHITE HOUSE
WASHINGTON

13 July 1994

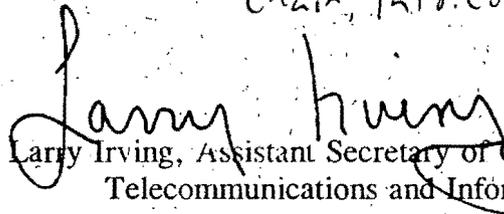
On behalf of the Information Infrastructure Task Force, we would like to invite you to a meeting to discuss Americans with disabilities and the National Information Infrastructure on Thursday August 4 from 2:00 to 4:00 in the Vice President's Ceremonial Office, Room 472 of the Old Executive Office Building. We are concerned about the NII being built in a way that would maximize its accessibility to all Americans and we seek your input on how best to accomplish this.

The size of the room requires that we limit this invitation to you only. If you can attend, please contact Susan Brummel, Director of the Clearinghouse on Computer Accomodation at GSA at 202-501-4906 or via electronic mail at susan.brummel@gsa.gov with your date of birth and social security number. A sign language interpreter will be present at the meeting, but please let us know if other arrangements are necessary.

Sincerely,



Sally Katzen, Administrator of the Office of Information and
Regulatory Affairs, Office of Management and Budget
Chair, Info. Comm.



Larry Irving, Assistant Secretary of Commerce for
Telecommunications and Information

Chair, Tele, IITF

Ms Yamborough (Whitman) -- size over
markets, few names in distribution
(K--) set aside.

Steve Selah --

Employment of pwd ~ to be created?
unlocking potential of THE MMD
econ potential

Al
"Sunny"

Somerton

Q: ^{does it affect} law ~~and~~ computer monitors ~~don't~~ ^{don't} ~~trans~~
Enforcement mechanism
Communications Act of 33 -- telephone relay

Larry Ladday (NCAM-WABH)

decoder chip -- apply to future TV systems
capturing part of advanced ~~teletext~~
TV; re closed captioning
B work underway;

Q: Neil Smith: Stanford U -- transport into
in more generalized format than
sound or video --

Diana Sorokin
XX

FCC: FM revenues becoming
unworkable because of pricing systems,
(1000s of licences) making it less

FCC Keesler: ^{viable} other ~~had~~ groups not as effective
as disabled community -- ^{role making} proceeds from
S.O. 3 day;

Vien Boyer -- DE NEI (positioning w/ some
problems along the way; -- distance + mobility
problems -- to set a file;

Alan Brackman -
Guidelines -- boring

Universal design -

Camden Yanks

Innovation: Baldridge Awards

Jim Tobias - Bellway

resistance carrier club

marketed

mutual allies

Debbie Kaplan - universal design

NIE - Russian disability

canceling / spread / to everybody
else

(parent)

"Really user friendly"

all applications ---

Longview: Travis
Merrill: sunny

user friendly

Sept 7-8

Oct 5-6

Billy Barnes to NIE

Next of kin: accessibility
tech exhibit - w/NIE

THE WHITE HOUSE

Office of the Press Secretary

App. D

For Immediate Release

July 27, 1994

REMARKS BY THE PRESIDENT
IN PHONE CALL TO DR. GLENN ANDERSON

The Oval Office

10:26 A.M. EDT

THE PRESIDENT: Dr. Anderson? Good morning. I want to begin by congratulating you on your appointment as the Chair of the Galludet University Board of Trustees.

I also want to thank you for your great career in rehabilitation work, and your earlier help to me when I served as governor.

I'm glad we can use this telephone network today because I know what an important link it is to millions of Americans. Go ahead.

DR. ANDERSON: Good morning, Mr. President. Thank you very much for your kind words.

I am very pleased to have this opportunity to speak with you this morning. Thank you for agreeing to make this relay call.

Also, I want to take this opportunity to thank you for your appearance at the Galludet University commencement last May. You inspired deaf people all over the country by your appearance and your wonderful commencement address. Go ahead.

THE PRESIDENT: Well, the honor was mine. I was very inspired by the students and their dreams.

I also want to say how very proud I am of the strong support we have been receiving from the deaf and disabled communities on health care reform. Go ahead.

DR. ANDERSON: Great. Yes, we very much care about improving health care services, and we are so glad that you have taken the lead in advocating for health care reform.

Hopefully, you will also be able to remind health care providers of how important it is that they be sensitive to the needs of people with disabilities for health care services and for access to reasonable accommodations. I am very inspired by your hard work, and will do all I can to support your efforts.

THE PRESIDENT: Well, of course, I will be sensitive to those things. And I think you well understand that the only way we can extend those benefits and opportunities to the disabled community is to cover all Americans. If we do that, we will be able to contain costs and empower disabled Americans to work and to live to the fullest of their abilities.

Let me say, also, before we close this conversation, how pleased I am that the ADA is working and giving us things like this telephone relay system. It's a great tribute to the work that millions of disabled Americans have done.

I want to make a special note of the work that your wife Karen has done and the help she gave to our campaign in 1992 and our efforts to reach out for all Americans. Go ahead.

DR. ANDERSON: Great. My wife is here with me, and she's grinning from ear to ear. She enjoyed the opportunity to serve you and work in your campaign.

I also want to say, yes, the ADA is working very well. And it will work even better in the years to come. Our conversation this morning is a living example of how well ADA is working. Go ahead.

THE PRESIDENT: I want to thank you again for all you have done to make the ADA work for people in their everyday lives.

It's been a real pleasure to talk with you today. One of my aides told me that your son, Jamal, and I have a picture together that you would like me to autograph. I'd be glad to do that, and I look forward to seeing you again soon. Signing off.

DR. ANDERSON: Great. Many, many thanks for this opportunity. Thank you, again, and you have a great day, too. Bye bye.

THE PRESIDENT: Goodbye.

END

10:35 A.M. EDT

THE INFORMATION SUPERHIGHWAY AND THE BLIND AND VISUALLY IMPAIRED

by

Brian K. Charlson
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Massachusetts Commission for the Blind
Boston, Massachusetts

Author: "Adaptive Technologies for Learning and Work Environments"
American Library Association, Chicago, 1993

Over the past decade, people who are blind have enjoyed a new renaissance in terms of information access. This has been chiefly due to the widespread availability of adaptive technology such as synthesized speech, electro-mechanical braille, and screen magnification systems. The online world has also offered much to persons with vision impairments, but developments in the Information Super Highway and the Internet pose grave dangers to the current level of information access for persons who are blind or visually impaired.

THE CURRENT STATE OF THE ART

Personal computers equipped with speech, braille, and magnification adaptive hardware and software have brought a golden age of information access to persons with vision impairments. Talking computers can be used to write, edit, and access electronic documents. Braille devices can be used to either display copy in electro-mechanical form or print hard copy braille from almost any word processing text file. Magnification hardware and software can enlarge text and display it in a comfortable mode for the user. Electronic reading machines can scan printed books and other text into a personal computer, allowing near instant access to information. Computers equipped with adaptive technology and modems can access computer-based bulletin boards, online services, and the vast Internet to send and receive information in an accessible format. For our purposes, we shall use the term accessible to indicate material and electronic equipment that can be utilized independently by persons who are blind or visually impaired.

Currently, blind persons using adapted personal computers can use the Internet for many important functions: electronic mail, file transfers, accessing document archives, etc. Electronic mail is an empowering technology for persons with vision impairments. This is due to the fact that an individual can use a personal computer equipped with adaptive technologies to independently send and receive electronic mail messages. Online archives

of text and computer software can also be accessed by blind persons using these adaptive systems, and an environment has been created that allows near instant access to this information. In the past, blind people used readers to record this information, or transcribers to translate it into braille, a time consuming process to say the least. On average, it can take weeks or months to transcribe a printed book into audio or braille format, a labor intensive and highly skilled process, with these delays often resulting in lost jobs, incomplete school assignments, and more than a little frustration.

THE PROPOSED INTERNET AND POTENTIAL PROBLEMS

The new Information Super Highway may become a barrier to accessible information, if proper procedures are not undertaken immediately. We will attempt to highlight some of the major potential problems in this section.

Graphics based menus and user-interfaces, if not properly adapted, can create an insurmountable barrier for the blind community. Current adaptive technology works chiefly with text-based systems, although there are a few graphics-based access technologies emerging. Each graphical user interface requires its own access technology, forcing blind computer users to use different and complex tools for each graphical user interface.

The storage of data as images, not text, presents another potential barrier for blind computer users. Current adaptive systems rely on ASCII-based text to perform reading functions. Documents stored as graphics images cannot be read by current adaptive hardware and software, and are thus inaccessible to blind users. This could prove to be a very difficult problem for people who are blind as graphics-based documents are expected to be in widespread use in everything from office correspondence to graphical electronic mail systems.

Interactive video systems distributed on the Internet also pose serious problems of access for persons who are blind and visually impaired, unless alternative display methods are enacted. These systems include, but are not limited to, document delivery systems, electronic shopping, online encyclopedias, etc.

Another disturbing trend is that of public information terminals or kiosks. These dedicated computer terminals, connected to the Internet, can pose grave dangers for blind users in their current conceived form. These information terminals are expected to rely heavily on graphics to display information to the user, and will also rely on touch-screen technology, both difficult for persons who are blind or visually impaired to access. These public access terminals, by their widespread nature, could pose a serious threat to information access for blind people, as they will be used for building directories, airline reservations, search and retrieval systems, and are expected to be as commonplace as public telephones.

Access to the printed word has always been a chief stumbling block for persons who are blind or visually impaired, witness the term "print handicapped" often being used to describe the visually impaired. As graphical user interfaces become more common, and spread to document delivery systems, blind people are in danger of losing access to stored electronic

information, which has been relatively accessible up to this point. The blindness community is in danger of losing information access as software manuals, office correspondence, and other printed materials migrate to graphics based systems. Steps must be taken to assure that adaptive technology can access documents created and distributed on the Internet.

Another danger is the merger of the cable television system with the Internet. Companies are beginning to offer information and other services that can be accessed using a standard cable television decoder, with the information displayed on standard television equipment. Unfortunately, this arrangement would prevent blind and visually impaired people from accessing the information, as adaptive technology cannot presently operate in this environment.

The expense of accessing the information superhighway is expected to be significantly higher for persons with disabilities than those without disabilities. The initial cost of the access technology required to turn a standard personal computer into an information retrieval device with either speech, braille, or magnified output can run as high as five to ten thousand dollars, depending on the exact nature of the equipment required. In addition, due to the relative slowness of using these alternative output devices, charging by the hour or by the minute (rather than by the amount of information retrieved or accessed) places the disabled person at a distinct financial disadvantage. Sensible pricing structures to take these important facts into account should be supported.

SOME POSSIBLE SOLUTIONS

We need a series of laws and regulations to establish minimum guidelines, and specific regulations, for information technology so that both the hardware and the user interface software will be accessible to all disabilities. In simple terms, we need an Americans with Disabilities Act (ADA) for technology products and services, where product is defined as any device interfaced to the Information Super Highway. The disabled population need interoperability among user interface options, not just interoperability among applications. an example of this might be a blind person using speech, a deaf/blind person using a braille device, a motor disabled person using a puff switch, while a non-disabled individual employs a touch-screen. this adaptive interoperability is no less do-able than interoperability among applications, but has received little attention. Some other solutions include, but are not limited to, the inclusion of persons who are blind or visually impaired in the creation, testing, and debugging process of new products. Open ended systems should be created that can interface with adaptive hardware and software devices. Where applicable, mainstream devices should have built in access features, or be able to easily interface with adaptive devices. User interfaces must become standardized, and easier to use, and customizable for the individual needs of each end user. Documentation and training materials must be provided in accessible formats. Mainstream and adaptive vendors should work together to create products that are accessible from the design stage to final production.

Access to the superhighway by persons who are blind or visually impaired must be as fast and efficient as that enjoyed by non-disabled users. Overall, success should be measured by useability and accessibility. Successful access is defined as receiving visual information through other means, including (but not limited to) speech output, braille output, or

enlarged output. We encourage our national leaders to champion this cause, as it is a just one. Inaccessible computers and information results in lost jobs, with individuals unable to realize their full potential. We must create a world where information can be accessed by every American, according to their abilities not their limitations.

TESTIMONY

presented by

**Paul W. Schroeder
Co-Chair**

**Consortium for Citizens with Disabilities
Task Force on Telecommunication/Communication Accessibility**

supported by

**American Council of the Blind
Association for Education and Rehabilitation
of the Blind and Visually Impaired
American Foundation for the Blind
National Center for Law and Deafness
National Association of the Deaf
RESNA
Telecommunications for the Deaf, Inc.
United Cerebral Palsy Associations
World Institute on Disability**

before

**UNITED STATES Senate
103rd CONGRESS, 2nd SESSION**

**COMMITTEE ON COMMERCE, SCIENCE
AND TRANSPORTATION**

May 24, 1994

51822

Summary of Testimony

Currently, much of the information required for full participation in our society is inaccessible to millions of people with disabilities. For example, daily newspapers, magazines, government documents, printed paper of all kinds, as well as much of what we see on TV is virtually unusable by people who have difficulty with seeing, hearing, using their hands, learning or a host of other functions. Consequently, these individuals find themselves excluded from opportunities for employment, education, entertainment and much more. Advances in telecommunications equipment, networks and services, along with the production and storage of information as digital text, are dismantling many of these artificial barriers which have prevented Americans with disabilities from enjoying the full rights and privileges of our society.

Yet, the emerging information infrastructure offers a paradox to all Americans, especially the nearly 50 million Americans with disabilities: On one hand, tremendous promise and potential for benefit; on the other hand, further isolation and disenfranchisement. Telecommunications technologies can bring increased independence in access to and use of a tremendous variety of information. However, market forces and expanding technological capability have failed to ensure the design and manufacture of products and services which are fully accessible to and usable by people with disabilities. Information appliances, storage methods and networks are being developed in a way which excludes millions of Americans with disabilities. Furthermore, the extremely high unemployment rate among Americans with disabilities means that affordability is even more critical for this population than for other groups.

To ensure that millions of Americans with disabilities have the capacity to exercise complete and independent control over the information they need to be full participants in society, Congress must pass legislation which directs the entire telecommunications industry to adhere to standards for full access by people with disabilities to telecommunications equipment, networks and services. Likewise, providers of television programming must be directed to provide access to such programs through the use of closed captions and video description. Finally, affordable access by people with disabilities to advanced telecommunications equipment and services must be a priority in the evolving definition of universal service.

Telecommunication policy reform provides Congress the opportunity to ensure that electronic curbcuts are built into the information highway. These curbcuts will provide people with disabilities full, independent and equal access to, and enjoyment of, new information technologies, services and programming. Ultimately, all consumers will benefit from efforts to provide access for consumers with disabilities.

Introduction

Good morning Mr. Chair, members of the Committee, my name is Paul Schroeder; I am the Director of Governmental Affairs for the American Council of the Blind. The American Council of the Blind is a national organization of blind men and women who seek to improve opportunities for people who are blind or visually impaired.

I am also testifying on behalf of the Consortium for Citizens with Disabilities (CCD) Task Force on Telecommunication/Communication Accessibility. Taken together, these organizations represent a wide-ranging coalition of individuals with disabilities and their families. We want to thank you for giving us the opportunity to address the interests and concerns of Americans with disabilities in this legislative effort.

Mr. Chairman, citizens with disabilities are especially grateful for your efforts, as well as those of many other Senators on this Committee, in support of important legislative initiatives such as the Television Decoder Circuitry Act and the telecommunications relay service of the Americans with Disabilities Act. We are also most appreciative of more recent efforts by this Committee to ensure that the National Telecommunications and Information Administration supports the development of applications which emphasize the needs of individuals with disabilities.

Mr. Chairman, members of the Committee, a seminal report--"Telecommunications and Persons with Disabilities: Building the Framework--submitted by the Blue Ribbon Panel on National Telecommunications Policy sums up the issues before this Committee by stating:

Existing laws pertaining to telecommunications and people with disabilities, taken together, amount to piecemeal and incomplete public policy. The predominant groups benefiting from existing law are people who are deaf and hard of hearing.

Now, however, virtually all people with disabilities are at risk of falling behind other Americans in their ability to take advantage of network-based technologies and services. Without access to these increasingly important information and communication tools, the promise of the Americans with Disabilities Act will be greatly diminished.

Given the rapid rate of advancement and change in this field, we cannot permit legislative change to move ahead slowly or too narrowly. Many different changes must take place, but they should be made within the context of a broad mandate for accessibility to the emerging telecommunications infrastructure.

In this testimony, I will focus on the critical importance of the information superhighway to the nearly fifty million Americans with disabilities and the many barriers to access and

use which confront these individuals. There is a need for Congress to establish statutory and regulatory requirements which mandate that telecommunications equipment and network services be accessible to individuals with disabilities. In addition, Congress must act to end the artificial barriers confronting Americans with disabilities in their enjoyment of and benefit from the plethora of television and video programming which is expanding so rapidly. I will argue that in ensuring that Americans with disabilities are a central focus of the developing information infrastructure, all Americans will benefit from the greater level of choice and user-friendly convenience which will be the result.

Telecommunications Technology and People with Disabilities

Improvements in communications technology and communication networks have dramatically improved opportunities for independence, productivity and integration for people with disabilities. The convergence of telecommunications technology and high speed networks could lead to enormous new opportunities for full and equal participation by citizens with disabilities in employment, commerce, education, health care, entertainment and democratic government. However, significant barriers continue to impede access by individuals with various disabling conditions to many common forms of information, as well as to specific telecommunication technologies. If effective, specific standards are not imposed to govern development of the information superhighway, then access for and use by people with disabilities will be spotty at best and virtually absent at worst.

Historically, telecommunications network and equipment providers have failed to ensure that their products and services are fully accessible to and usable by people with disabilities. Unfortunately, this failure continues today. The examples of inaccessible telecommunications and information technology seem endless.

- It took over one hundred years (with the passage of ADA in 1990) to ensure access to "POTS" (Plain Old Telephone Service) for individuals with significant hearing and speech disabilities, something virtually every other citizen has long taken for granted. As the telephone became more and more ubiquitous, people with significant hearing and speech impairments became more and more isolated.
- Today, the ever expanding use of graphical user interfaces and image-based information storage are taking the power of computers and information networks out of the hands of people who are blind, as well as individuals with certain motor disabilities and those with some learning disabilities. Even the Internet, which had been extremely usable by individuals with various disabling conditions, is increasingly being dominated by an interface called Mosaic which is only partially accessible to many users with disabilities. (Mosaic was developed by the National Center for Supercomputing Applications). (For additional information, see attachment "Assuring Access for the Disabled," from the Chronicle of Higher Education, May 4, 1994.)

- The exploding use of information menus that require voice responses shuts out millions with speech disabilities.
- Users of electronic augmentative communication devices can't get recognition on many existing voice networks.
- Audio text systems which are becoming so common are virtually unusable by people who are deaf.
- Heat or touch sensitive input devices, now commonplace in many information devices, are often virtually unusable (as currently implemented) by individuals with visual or motor disabilities.

These examples, and numerous others which could be cited, are not included here to suggest that the telecommunications industry intentionally discriminates against millions of Americans with disabilities. Nonetheless, developments in telecommunication technologies and services continue to move forward without regard to, and often in ignorance of, the universal access needs of millions of individuals with various disabilities. Government has a duty to ensure that the needs and desires of the users of the national information infrastructure are paramount in the formation of telecommunication policy. Congress cannot, and must not, assume that private industry will voluntarily include the millions of Americans who are disadvantaged by disability or economic status in the emerging information marketplace.

The Need for Access Requirements

For far too long, access to information for individuals with disabilities has depended largely upon the availability of expensive, adaptive equipment. Most of the adaptive equipment--such as telecommunications devices for the deaf (text telephones originally designed for deaf people) or the hardware/software interfaces necessary to allow individuals with visual, speech or motor disabilities to work a personal computer--were developed by small entrepreneurs working feverishly to catch up with developments in the technology they were trying to make accessible. Unfortunately, these access-oriented entrepreneurs have largely worked without assistance from the mainstream corporate developers of telecommunication and other information technology. Consequently, people with disabilities have often been required to spend more than nondisabled individuals for access to hardware and software which quickly becomes obsolete as new developments outstrip the adaptive technology.

Mr. Chairman, this "separate and unequal" (and expensive) system of access to important technology and services for people with disabilities must end. After the passage of the ADA, this is now the logical next step toward bringing an end to disability-based discrimination and isolation.

That is why our Task Force of organizations representing people with disabilities worked so hard to craft requirements to direct the development of access standards as a part of telecommunications policy reform. Fortunately, we found negotiating partners representing the Regional Bell Operating Companies who were also interested in discussing access for people with disabilities to the new information frontier.

The agreed upon language has been included in slightly different forms in both H.R. 3626 and H.R. 3636. Taken together, both legislative proposals would require that "telecommunications equipment and customer premises equipment designed, developed, and fabricated" by a Bell Operating Company manufacturing affiliate (H.R. 3626), and "advances in network services deployed by Bell Operating Companies" (H.R. 3626) or "local exchange carriers" (H.R. 3636) "shall be accessible and usable by individuals with disabilities, ... unless the costs of making the equipment accessible and usable would result in an undue burden or an adverse competitive impact." In addition, the language states that whenever an undue burden or adverse competitive impact would result from these requirements the covered entity which manufactures the telecommunications equipment or provides the network service shall ensure that the equipment or service is compatible with existing peripheral devices or adaptive equipment commonly used by persons with disabilities, unless doing so would result in an undue burden or adverse competitive impact. H.R. 3636 also includes a provision which would require the FCC to review the standards and requirements at least once every 3 years through a proceeding to find out whether these regulations have ensured that advances in network services are accessible and usable by individuals with disabilities. That legislation also includes a direction to the FCC to commence an inquiry "to assess the impact of deployment of digital technologies on individuals with disabilities, with particular emphasis on any regulatory, policy, or design barriers which would limit functionally equivalent access by such individuals."

The language does not impose a legislative solution, rather it clearly favors negotiation under the auspices of the FCC between industry and people with disabilities in order to arrive at a solution. The language also incorporates flexibility to ensure that solutions can evolve over time to meet the rapid advances in telecommunication technological development. We note that this language was a compromise which establishes the principle of full access along with the inclusion of exemptions for circumstances where access cannot be provided because of an undue burden or adverse competitive impact. The disability community is concerned about the language which provides for exemptions from access requirements where an "adverse competitive impact" would result. However, we believe that the ultimate requirements worked out with industry and the FCC will narrowly interpret that clause to ensure that a mere effect on profit would not be sufficient in itself to trigger the exemption. For example, the final standard would likely indicate that the number of consumers or consumer products potentially benefiting from the development and implementation of an accessible design innovation may be a relevant consideration in determining whether the activity in question imposes an undue burden or adverse competitive impact.

The disability community believes that S. 1822 offers the best opportunity to extend the access requirements currently contained in H.R. 3626 and H.R. 3636 to all players in the huge and growing telecommunication industry. We note that the newly proposed Sec. 229 in S. 1822 already includes the framework around which a broader disability access requirement could be built

[(d)(4) DISABILITY ACCESS.--The Commission and the States shall ensure that advances in network capabilities and telecommunications service deployed by telecommunications carriers are designed to be accessible to individuals with disabilities)..

It is in the public interest to ensure that all sectors of the telecommunications industry address the access needs of individuals with disabilities when developing, designing or fabricating telecommunications equipment, networks or services. We believe that the FCC should be responsible for setting the standards rather than allowing access provisions to be fragmented between the FCC and the states. In short, if the Regional Bell Operating Companies can agree to manufacture telecommunications equipment and design network services to be accessible to people with disabilities, there is no compelling reason why all other players in the industry cannot meet this reasonable goal.

A Step Toward Universal Design

These requirements are an important first step toward a concept of universal design. (The goal of universal design is to build or design a piece of equipment or a network which is equally accessible to and usable by the vast majority of individuals including people with disabilities). Toward this end, it is critical that telecommunication networks and equipment be not only interoperable but also fully accessible to and usable by Americans with Disabilities. The equipment and networks which will become the information infrastructure must offer the potential for output/display of information in multiple and synonymous modes including audio, visual, and tactile, along with choice among operating methods including speech, keypads, point and click mechanisms, simplified interfaces and other activation mechanisms usable by individuals with various disabilities. The solutions for access--if designed into the new appliance, network or service--are low cost, mostly no cost, straightforward and beneficial to people without disabilities as well as to people with disabilities. (For additional information see attachment "Use of Multiple Parallel Interface Strategies to Create a Seamless Accessible Interface for Next-Generation Information Systems.)

Because access to the information highway will increasingly depend upon multifunctional information appliances, it is important to ensure that providers regulated under Title VI of the Communications Act, (and Title VII, if the Congress adopts the Administration's proposal), should be required to meet the access needs of individuals with disabilities. For example, many current Cable-TV boxes are not fully usable by, or accessible to, individuals with disabilities. This situation is only likely to worsen. The future hybrid information

appliances, such as the so called "set-top box," may or may not be covered under Title II of the Communications Act. Expanding the coverage of the access requirements to all relevant industries and providers would enhance equality for people with disabilities and establish parity within the telecommunications industry with respect to ensuring access.

Access Requirements Have Worked

The Television Decoder Circuitry Act provides the best legislative example of how well access requirements can work. The Electronics Industry Association (EIA) expressed many concerns about the Television Decoder Circuitry Act that are similar to concerns which are likely going to be raised about these access requirements. For example, EIA raised concerns about the costs of manufacturing the decoder chip, its technical feasibility, and time frames for its implementation. However, the EIA and television manufacturers learned that the costs, technical solutions, and implementation dates were manageable. In addition, they learned the television sets would be functional for the hearing impaired, learning disabled, and people for whom English is a second language. After the Decoder Act went into effect, EIA launched an advertising campaign, called CAPTION VISION, to promote the sales of television sets with built-in decoder circuitry. One television manufacturer, the Zenith Electronics Corporation, conducted an aggressive selling campaign of these decoder sets, focusing on the hospitality industry, resulting in a banner sales year for Zenith. One manufacture tied the closed caption feature to the mute control.

We cannot afford to forget, Mr. Chairman, that the industry, at the time, saw that proposal as onerous and bad for business. It is likely that some businesses in the telecommunications industry will complain that the requirements for full access by people with disabilities to telecommunications equipment and networks will be onerous and bad for business.

The manufacture of hearing aid compatible telephones provides another example illustrating that accessibility provisions are essential, not burdensome and that industry can adapt to meet them. Prior to the early 1980s, most telephones were voluntarily hearing aid compatible. Unfortunately, after deregulation, with no standards to mandate hearing aid compatible telephone equipment, non-compatible telephones began to appear virtually everywhere. The Hearing Aid Compatibility Act of 1988 required that all telephones manufactured in the U.S. or imported for use within the U.S. after August 16, 1989 be hearing aid compatible. Although some provisions of the law have not yet been implemented satisfactorily, the manufacture and sale of hearing aid compatible telephones is providing access for individuals with hearing aids and improved telephone access to all Americans.

Closed Captioning and Video Description

Americans with disabilities, particularly those with hearing impairments and vision impairments, believe that the time is right to ensure that video programming is fully accessible. For too long, individuals with hearing and visual disabilities have been unable

to benefit from significant portions of televised programming. In the new world of megachannel platforms (including channels to be used in schools) and video on demand, this lack of access will be magnified a thousand times. The barriers to access for these Americans are unnecessary and harmful; and they can be readily dismantled. Closed captioning and video description offer enormous potential for full access for individuals with disabilities and they also offer useful benefits to others in the population. We urge the Committee to include language in S. 1822 which requires providers of television programming to provide access to such programs through the use of closed captions and video description.

Video Description

Video description serves a compelling national purpose by providing a legitimate and essential means of access for blind and visually impaired Americans to video programming. Without a clear, unambiguous requirement for access to video programming through video description, millions of blind and visually impaired Americans will be deprived of the benefits and enjoyment of the vast variety of video information and entertainment delivered via telecommunications networks to American households. As a consequence, these Americans will be asked to pay full price for video services while deriving only half the value. If access to video programming is not ensured, policy-makers will be sending a message to Americans with disabilities: separate and unequal access is acceptable in telecommunications policy.

Full participation in our society requires that blind or visually impaired people be able to independently gain access to the cultural, social and educational information included in the video programming provided to U.S. households through such means as broadcast, cable and direct broadcast satellite. If 85 percent of Americans say that television is their primary source of news and information, it is unconscionable to deny full access to that medium to one sector of the population, especially when it has been proven feasible to provide such access. Video description is a proven means of providing equal access for people who are blind or visually impaired to television/video programming through narrated descriptions of inaccessible visual elements of such programming.

Video description is currently delivered over the Secondary Audio Program (SAP) channel by nearly 100 PBS stations, in 29 states covering 64 percent of U.S. television households. It is the largest single service provided over the SAP and the only current national user of the channel. In addition, the Narrated Television Network is a cable TV network which now broadcasts 20 hours of video described movies each week to over 1028 outlets covering over 25 million households. NTN includes the video description as part of the actual movie audio and the description is therefore available to any Cable subscriber whether blind or sighted. Finally, the advanced TV standard includes a channel designated for video description. Both the SAP and the Advanced TV standard allow the consumer to choose whether or not to hear the video description.

We firmly believes that video description will serve other important interests. For example, video description should assist individuals with learning or cognitive disabilities, those with limited literacy and children in deriving greater benefit from video programs. In addition, video description will provide a level of convenience to all television viewers because it will provide an enhanced level of choice in "viewing" such programs.

The cost to provide video descriptions run from \$2,000 to \$5,000 per hour depending on various factors. Some of these factors include: medium (e.g., television broadcast or home video), program type (e.g., documentaries or drama), series type (science, nature, drama, children's) and the cost of the narration session. These costs are a small fraction of the costs incurred in producing televised or other video programming.

Universal Service

Mr. Chairman, a ramp onto the information highway is perhaps more critical for Americans with disabilities than for any other group of Americans. Individuals with disabilities continue to face numerous, nearly insurmountable barriers in obtaining information and in expressing their views. Advances in telecommunications equipment networks and services are dismantling many of these artificial obstacles to the free flow of information, but only for those individuals fortunate enough to be able to take advantage of the new opportunities. The production, storage and distribution of information in digital-text formats has the potential to prevent the continued isolation and exclusion of Americans with Disabilities. When captured in a digital-text format a newspaper, letter, book, virtually any piece of information, can readily be made accessible to and usable by individuals with disabilities and transmitted immediately over tremendous distance, at high speed and in immense volume. For individuals with disabilities, the information highway may be the only way to obtain access to a great quantity of information and services--from the mundane to the metaphysical. In short, individuals who are not disabled already have many sources from which to select most of the information they need to live independently and participate fully; individuals with disabilities cannot take advantage of most of these common sources and are therefore eager for the development of the information highway and the enormous potential for information access which it contains. For example, millions of Americans with disabilities, like me, cannot "read" standard printed material such as a newspaper or mail-order catalog. But with the proper electronic equipment, network and interface, we can read a digital-text newspaper or browse through an electronic catalog. With a proper electronic interface, an individual with a speech disability can communicate to others through communications networks and get equal services.

Other barriers also exist which cause individuals with disabilities to require enhanced and more immediate access to the information infrastructure. For example, architectural barriers and the lack of affordable public transportation prevent millions of individuals with disabilities from independently and conveniently purchasing food, clothing and other items. Through on-line services, these Americans are increasingly able to browse, examine and compare prices and promotional material. Even more important, the power of the new

information technology and services can open opportunities for employment and education as well as alternative methods for handling some health care and personal assistance needs for individuals with disabilities.

Affordable access by people with disabilities to advanced telecommunications equipment and services must be a priority in the evolving definition of universal service. We urge the Committee to amend S. 1822 to include in the charge to the states and the FCC to establish a priority for the provision of advanced telecommunications equipment and services to individuals with disabilities who would otherwise not be able to participate fully in the emerging information-based society. In addition, we urge the Committee to amend Section 103(b) of S. 1822 to ensure that advanced telecommunication services provided to schools, health care institutions and libraries are accessible to and usable by people with disabilities.

Privacy

It is paramount that privacy safeguards in any proposed legislation also address the needs of individuals with disabilities and their family members. As more and more records kept by employers, health care providers and social service providers, among others, become "digitized", electronic access and transmittal becomes more likely, including the possibility of access by unauthorized users or by authorized users that results in discriminatory behavior by the user. To prevent the "information highway" from becoming a "snooper highway" to the detriment of individuals with disabilities, CCD supports strong curbs and punishments for illegal and discriminatory use of information electronically gathered. CCD notes that included among the class of individuals protected from discrimination by ADA are those with a record of having a disability. CCD also notes that similar protections are extended by ADA to the associates of individuals with disabilities. To wit, "It is discrimination to exclude or deny equal goods and services to an individual or entity because of the known disability of another individual with whom the individual or entity has a relationship or association".

For instance, it is conceivable that during a mortgage application process, an electronic file containing details about an individual's modifications to a property negotiated during the purchase agreement stage -- modifications such as doorway widening or a custom alarm system for a person with a vision or hearing disability -- could result in denial of an application when the mortgage broker learns in this fashion that the applicant, or a family member, has a severe disability.

Conclusion

The revolution in communications, the production and distribution of information and entertainment now underway offers Americans with disabilities unparalleled opportunities for equality and advancement. The information superhighway will transform the content and conduct of work locally, regionally, nationally, and globally enhancing opportunities for employment for individuals with disabilities as well as greater benefits resulting from the

increased productivity that these technologies make possible. Interactive communication offers tremendous potential for the delivery of efficient and effective education, health care, and possibly even personal assistance services for individuals across the age and disability spectrum.

Those who have the ability to obtain and use information have the power to make choices and enhance our opportunities for independence, productivity, and self-sufficiency. But, artificial barriers have been interposed by society between individuals with disabilities and our freedom with respect to information. That is why the Consortium for Citizens with Disabilities believes it is so important for the legislation you are considering to accelerate the process of systematically dismantling these barriers by ensuring that the communication accessibility needs of individuals with the full range of functional disabilities are advanced right along with advances for all Americans. This is best accomplished not by government acting alone but by ensuring that both the private and public sectors design an information superhighway which is usable by and accessible to all individuals.

Telecommunication policy reform provides Congress the opportunity to ensure that people with disabilities have full, independent and equal access to, and enjoyment of, new information technologies, services and programming. Ultimately, by ensuring that Americans with disabilities are a central focus of the developing information infrastructure, all Americans will benefit from the greater level of choice and user-friendly convenience which will be the result.

With the passage of ADA, people with disabilities no longer have to accept second class access to buildings and the physical community, and we now look forward to ending second class access to the electronic community.

greatest hardware in the world, she says, the ATIC lab does have a brain trust. "The people around the institute are so giving," she says. When someone with a disability explains about the need to perform a specific task, "you pull in a couple of engineers, and they say, 'Well, what if we made this thing that did this for you?' And they

digitize books so that the computer can read them aloud to the blind. Ms. Corbett, who started life at the university as a sign language interpreter, works with John F. Murphy, manager of research computing for the university, an unusual arrangement. At most institutions, services for the disabled and the campus computer center operate independently of one another.

data on how such equipment is best used.

"A few years down the road, we're really going to see the impact of adaptive computing on postsecondary education," Ms. Corbett says. "We'll have real numbers and hopefully some proof that it's cost effective, that students' grade-point averages increase, their course loads increase, they stay in school. All of those are kinds of things that we're hoping we'll be able to show."

Eventually, MassACT may be opened up to private colleges and universities, and even institutions that are out of state. But their federal grant runs out very soon, and for now, the developers are struggling along.

In that sense, at least, the programs at MIT and the University of Massachusetts are identical, says Ms. Jones of MIT. More money, more staff, more equipment, and more space are needed. "We all wrestle with those same kinds of issues," she says.



Charlotte Corbett of the Adaptive Computing Lab with John F. Murphy, manager of research computing: "We're an off-the-shelf group."

"A few years down the road, we're really going to see the impact of adaptive computing on postsecondary education."

'VERY CLOSE RELATIONSHIP'

"Other places, the computer-services people keep the equipment up and running, but can't provide services to people," says Mr. Murphy. "Or the people in the disabled-student center want to provide service, but can't get the equipment to run right. We work together in a very close relationship."

Founded in 1987 with an \$18,000 grant from the university, the laboratory primarily served the campus until the state legislature allocated funds for the purchase of machines that can read digitized text aloud at each state institution. In 1991, the U.S. Education Department's Fund for the Improvement of Postsecondary Education gave the group run-by Ms. Corbett and Mr. Murphy a three-year, \$240,000 grant to help state institutions get the adaptive-computing equipment up and running and create some kind of support group.

The result was MassACT in Higher Education, a statewide adaptive-computing coalition that involves 13 colleges and universities. Participants share problems and solutions, develop training and effective usage programs, and collect

vander out and come back with his finished thing that's exactly what the person needed."

That's the same kind of give and take that happens at the University of Massachusetts, with one major difference. "We don't have an engineering school," says Charlotte Corbett, coordinator of the university's Adaptive Computing Lab. "We're an off-the-shelf group."

The people who work with Ms. Corbett use the lower end of the high-tech spectrum to help people make use of technology. That means no computers that can type words as people say them, but several plain-vanilla machines set up with standard types of programs and assistive software. The lab has things like programs that enlarge screen displays for people with poor vision, and scanners that can



Wireless Classroom an Instant Network at Duke

Exploring the Apple Virtual Campus



It becomes almost a Zen exercise: How do you best use computers to teach computer science? Assistant professor Dr. George Stetten, of the Department of Biomedical Engineering at Duke University in Durham, NC, decided the old method of the instructor strolling down aisles of computers and stopping to give each student individual instruction had become outmoded.

Zap! You're a network

Instead, he devised a so-called wireless classroom,

to speak," comments Dr. Stetten. "We can build programs communally. For instance, I can say we need a 'for loop' here, and someone will type it, and it will appear immediately on the big screen."

Student-centered

Although some of Dr. Stetten's colleagues thought projecting students' work might embarrass them in front of their peers, this has not happened. In fact, the students eagerly help each other learn.

Another plus is the portability of the system.

Assuring Access for the Disabled

Growing use of graphical devices in computing is cutting some people off

By David L. Wilson

OFFICIALS at the National Science Foundation thought they were being helpful when they installed easy-to-use computer software that enables their employees to use the Internet by pointing and clicking with a mouse on icons and buttons on a screen.

An employee can browse through the latest list of NSF grant recipients, for example, by calling up a map of the United States. Click on an image of North Carolina, and a list of projects in that state appears. Click on a specific grant at North Carolina State University, and up comes a document stored on a computer at the institution.

The changes were helpful to many employees. But they made it impossible for Larry Scadden, an accomplished Internet user and senior program director of the NSF's program for people with disabilities, to use the office's computers.

HELPLESS SOFTWARE, HELPLESS USER

Mr. Scadden is blind. Until last month, he used a computer equipped with software that can speak words aloud as they appear on his computer screen. That software, however, is helpless when it comes to things like buttons on the screen; it does not recognize them. Mr. Scadden has been effectively cut off from the Internet.

"They took it away, and I'm the one who used Internet all the time," says Mr. Scadden, who adds that technicians are trying to solve the problem. "Now I have to go home to do some of my work."

Mr. Scadden's predicament frightens a large number of blind professors and students who have embraced the computer and the Internet as a means of freeing themselves from dependence on others. They have been able to read newspapers, produce journal articles, and even shop on line without assistance.

The broad movement toward graphical applications using buttons that cannot now be read aloud or translated into Braille has sparked widespread concern among the blind. Many people are working on solutions to the problem, and experts say there are ways around it.

OMINOUS PITFALLS

But even if blind users can get past icons and buttons to open up a computer program, they may face a much more ominous difficulty once they get in. As the power and speed of computers and networks increase, more and more information is being displayed using images and graphs, such as pie charts, instead of lists of numbers. Sighted people find such images more useful than the raw data they represent, but researchers say they have no clear idea of how to enable the blind to interpret information presented in that form.

With the development of the National Information Infrastructure, the data highway proposed by the Clinton Administra-



JOSEPH KING FOR THE CHRONICLE

Norman R. Coombs of the Rochester Institute of Technology: "A lot of blind people have gotten near-hysterical about this."

tion, computers will play an inescapable role in everyday life and be used for everything from registering voters to ordering pizza. The blind are afraid they will be cut off from computers that present information in ways they cannot interpret.

When the Apple Macintosh was introduced a decade ago, it used a "graphical user interface," or GUI (pronounced *goo-ey*), and was praised by many who said pointing and clicking at icons was the future of computing. Blind people, however, could not use the Macintosh, because no screen-reader software was available. They ignored the new computer and stuck with those based on a design by the International Business Machines Corporation. On those, users could type letters on a screen to get to a specific file, and the computer would respond with letters on the screen as well, which the screen-reader software would recite aloud.

Eventually, software designers developed programs that could verbalize the layout of a Macintosh screen. Such programs recently became available for GUI's

built for computers based on the IBM design as well. Today, the most common GUI is called Windows, and until very recently, the blind were hoping they could ignore that as well, since even the best screen-reader software tends to break down and leave a user stranded.

DOMINANCE OF WINDOWS

Over the last three years, however, Windows has come to be the dominant force driving the computer market, as have the IBM-type computers on which it runs. Windows essentially makes an IBM computer run like a Macintosh. Today it is hard to find new software on the market based on the old "command line interface" that the blind had come to depend on.

Even computers that run UNIX, the operating system used by powerful workstations that are used by scientists and are the workhorses of the Internet, are now frequently operated by pointing and clicking. The GUI has come to dominate the market because software based on such a system

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Use of Multiple Parallel Interface Strategies to Create a Seamless Accessible Interface for Next-Generation Information Systems

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Abstract

The next generation of information system is rapidly moving toward touchscreens or pointing devices combined with graphic displays. While these interfaces make the information systems much friendlier for individuals with cognitive disabilities as well as for the general population, they pose significant new barriers for individuals with physical, visual, and, if sound is involved, hearing impairments. Special access software can be used to provide access to personal computers. When these information systems show up in public places, community centers, libraries, etc., however, it is not possible to install individual software to meet individual needs. To provide access to these information systems, a seamless adaptable human interface protocol is proposed which allows users to incrementally modify the command and presentation aspects of the human interface to match their abilities and preferences. A first implementation of the protocol is presented.

Statement of the Problem

The basic objective is to create an interface protocol, including command and control structures, which would support multiple control strategies (mouse, keyboard, touchscreen) and presentation forms (standard graphic, large print, voice) simultaneously. In this fashion, users could mix or match any and all of the control and presentation formats in order to best accommodate their individual needs. While a strictly hierarchical branching structure would achieve this, it also made operation of the system rigid and unnatural. This would cause the system to be unacceptable to commercial parties as a standard interface on mass market products. Thus, the structure also had to be able to support flexibility and a free flow.

Approach

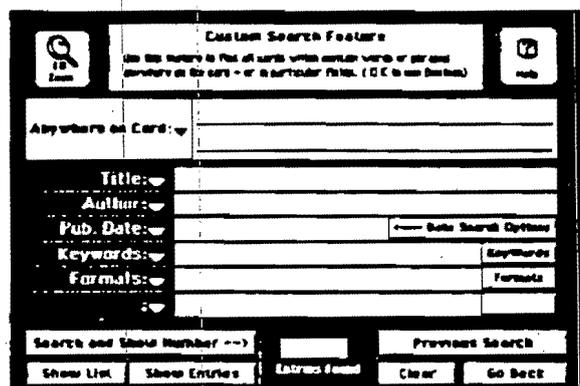
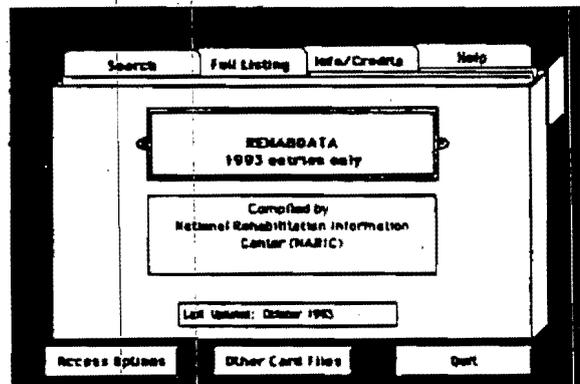
A modified multi-level object-based hierarchy was therefore used. With this structure, the current objects on screen form a context. Using a Tab key or the Control key combined with a letter key, the individual can move around amongst the objects (buttons, fields, etc.) or groups of objects (e.g., a grouping of related buttons). The Space bar and Enter key are used to act on the objects. The Space bar would be used to press buttons and to mark things in a list; the Enter key would function to activate the default button or achieve the same effect as a double-click, depending upon context. Arrow keys would be used to move about within fields. If the voice mode is turned on, the Alt and Control keys can be used with the arrow keys to cause the system to read a letter, word, sentence,

paragraph, or the entire text fields, moving either forward or backward.

The output options include either standard graphic display, graphic display with larger print in fields where the information changes, voice output, and a large print mode which supports fonts up to 72 point.

The PMM Database Implementation

The first implementation of the protocol is in a bibliographic database software package titled Publications, Media and Materials (PMM). This is a software package which was developed for the Trace Cooperative Electronic Library. The software is compatible with any ProCite or ProCite-compatible bibliographic software (such as EndNote). Figures 1, 2, and 3 show standard graphic screens from the database. The database can be operated using a mouse or can be operated entirely from the keyboard.



Seamless Access for Next-Generation Information Systems

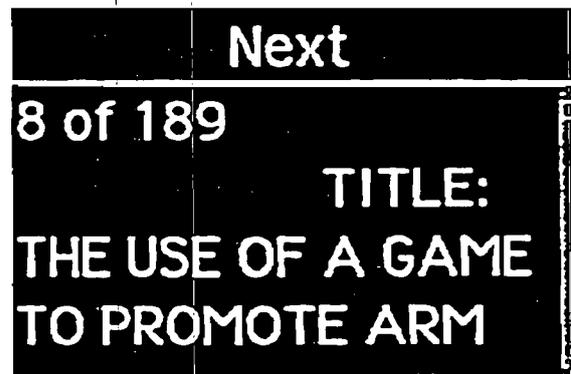
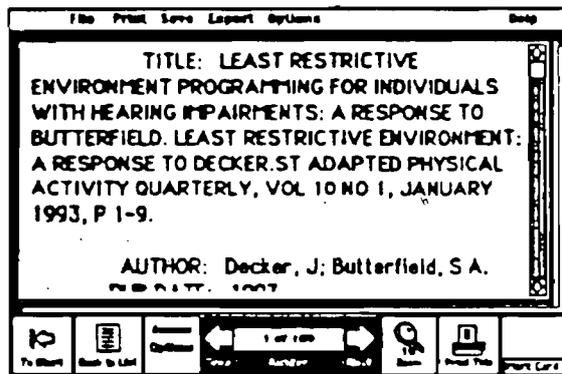
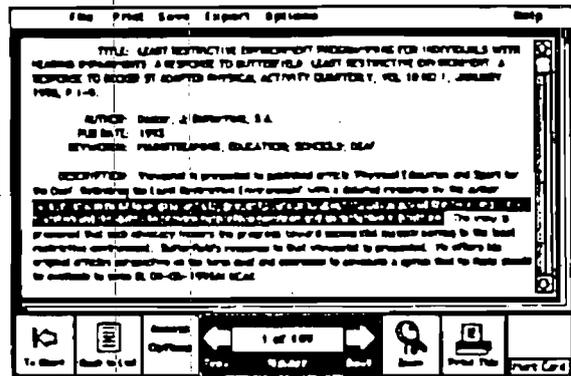
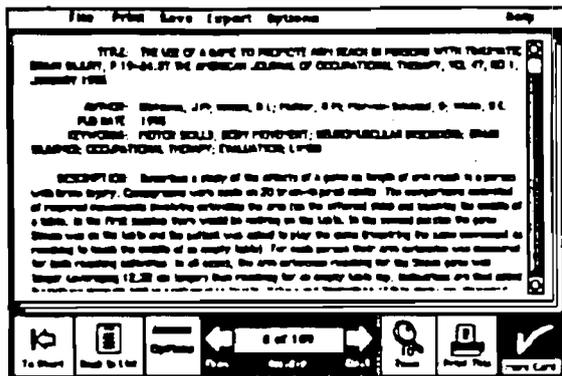


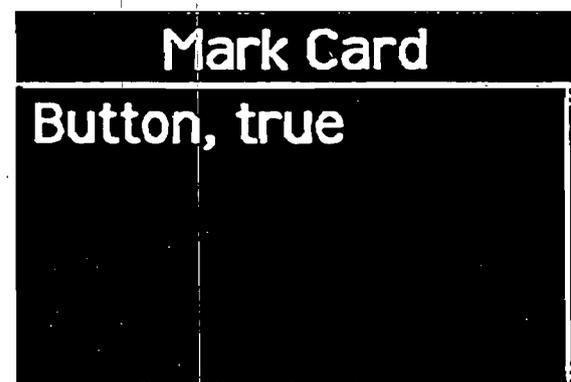
Figure 4 shows the ability of the database to enlarge the text in the data field. For some users, it is unnecessary to enlarge buttons and other controls, since once they have used the database for a short time they can recognize and use the controls without having to enlarge them and use up valuable display space on the screen. However, they need to have the text in the actual data fields enlarged so that they can easily read it.

Figure 5 shows the database in its voice output mode. Using the arrow keys in combination with the Alt and Control keys, the individual is able to highlight letters, words, phrases, sentences, paragraphs, etc., and simultaneously have them read aloud. Similarly, as the individual uses the Tab (or Command-Letter) key to move about on the buttons and fields, the voice output option would read the name of the field or button, along with its state (on, off, etc.). Using the keyboard control mode and this voice output capability, it is possible for individuals who are completely blind to operate the database.

Figure 6 shows the database in its large print mode. In this mode, all of the information is presented in two large fields which can be adjusted in size and font. Their can be adjusted to fill the entire screen, and can present up to a 72-point font.

The top field gives the name of the object (the field, button, screen, etc.). The bottom scrolling field is used to present additional information about the object (e.g., whether a button is on or off) as well as the contents of any field selected. In Figure 6, the individual has tabbed up to the main data field, which is called "Card Text." The text of the field appears in the bottom large print field.

In Figure 7, the individual has tabbed to the button which appears in the bottom right-hand corner of the screen in the normal text mode. This is a button that is used to mark or unmark a particular entry. In this case, you can see from the field that the button is currently turned off. Hitting the Space bar would toggle the button on and off in the large print mode in the same way that hitting the Space bar would toggle the checkmark on and off if the individual had tabbed to the "Mark Card" button (or had used Control-M to jump there). Individuals who were using a mouse would click on the button to mark or unmark the card.



This large print mode has a number of advantages for individuals with severe visual impairments. First, it presents all of the critical information in a very large, high-contrast sans serif font. Second, it uses an iso-location strategy for presenting the information to the user; that is, the information is always presented in the same location on the screen. As the individual with low

Seamless Access for Next-Generation Information Systems

vision "tabs around" the screen, they do not have to keep searching the screen to try to find out where they are. The information about their location is always presented at the top center of the screen. They also do not have to worry about missing particular buttons or features. By successively hitting the Tab key, each and every button or field on the screen will be presented to them. Once they are familiar with the contents and buttons on the screen, they can jump directly to the items they are interested in by using the Control key along with the first letter of the object (button, field, etc.). If more than one object starts with the same letter, they would simply continue to hold the control key down and hit the letter again until the desired object came up. They can also type multiple letters to instantly call up any item if it shares a common first letter with other objects.

Strategies to Increase Efficiency of Access

In addition to the basic strategies which in themselves provide complete access, there are a number of additional strategies which are incorporated to allow individuals with disabilities to have more efficient access. Whenever an individual is in a list, typing the first letter or letters of an item in the list will cause the highlight to jump to the line or item that begins with those letter(s). The Control-letter function provides a similar jump capability to any object on the screen. In both cases, a minimum-to-distinguish strategy is used which allows the individual to type multiple letters in order to jump directly to the desired item.

In addition, when operating in either the voice output or large print mode, additional context information is provided with some actions. For

example, the "Next" arrow button is used to move through the different card entries. Normally, in the large print the individual would tab to the "Next" button and then activate it. They would then have to tab up to the card text field in order to see the title of that next item. In actuality, however, when using the "Next" button in the large print mode, the title of the next entry is automatically displayed in the bottom field along with the count. As a result, the individual can sit on the "Next" button and successively activate it. Each time they do, the bottom field will display the number of the new entry and its title. The individual can then simply use the arrow keys to begin reading any entries of interest.

Conclusion

Although this implementation only demonstrates the technique on a single database, it does provide an interesting opportunity to study the technique while simultaneously providing broad-based consumer access to the Publications, Media and Materials (PMM) database on the Co-Net CD. The technique is now being expanded and implemented on other databases. In addition, its use with touchscreen-based information systems is being explored.

Acknowledgements

This work is supported in part by the National Institute on Disability and Rehabilitation Research, US Department of Education, Grant H133E30012.

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User Type/ Characteristics

Features

All users

- Operable using mouse, touchscreen, or from the keyboard, at user option.
- Friendly, easy to understand graphical interface.
- Ability to have sounds visually depicted for noisy environments or no-sound environments (e.g., libraries).
- Zoom data text for easy reading.

Users with...
...manipulation difficulties

- Ability to operate entirely from keyboard.
- Print to paper or print to disk.

...somewhat low vision

- Ability to zoom data text, with fonts from 12 point to 48 point.
- Operable from keyboard if mouse is difficult to see.

...low vision

- Keyboard operation.
- Full-screen large print mode (up to 72 point).
- Single focus point information display feature within the large print mode.
- Voice output mode.

...blindness

- Operable completely from keyboard.
- Full voice feedback mode (does not require screen reading software).

...cognitive/ language impairments

- Easier to understand graphic interface.
- Touchscreen capable.
- Voice output mode.

...hearing impairments

- Option for all auditory information to be presented visually.

AMENDMENT 1.

OFFERED BY

TO S. 1822

(Page & line nos. refer to Bill as Introduced, 2/3/94)

Sec. 229(d)(4)

Page 20, strike line 24 and all that follows through page 21, line 2 and insert in lieu thereof the following:

"(4) **DISABILITY ACCESS.--**

"(A) **MANUFACTURING.--**The Commission shall, within 1 year after the date of enactment of this title, prescribe such regulations as are necessary to ensure that telecommunications equipment and customer premises equipment designed, developed, and fabricated pursuant to the authority granted in this title shall be accessible and usable by individuals with disabilities, including individuals with functional limitations of hearing, vision, movement, manipulation, speech, and interpretation of information, unless the costs of making the equipment accessible and usable would result in an undue burden or an adverse competitive impact.

"(B) **NETWORK SERVICES.--**The Commission shall, within 1 year after enactment of this section, prescribe such regulations as are necessary to ensure that advances in network services deployed by telecommunications carriers shall be accessible and usable by individuals

with disabilities, including individuals with functional limitations of hearing, vision, movement, manipulation, speech and interpretation of information, unless the cost of making the services accessible and usable would result in an undue burden or adverse competitive impact. Such regulations shall seek to permit the use of both standard and special equipment, and seek to minimize the need of individuals to acquire additional devices beyond those used by the general public to obtain such access.

"(C) COMPATIBILITY.--Such regulations shall require that whenever an undue burden or adverse competitive impact would result from the requirements in subparagraph "(A)" and "(B)", the manufacturer that designs, develops, or fabricates the equipment or the telecommunications carrier shall ensure that the equipment or network service in question is compatible with existing peripheral devices or specialized customer premises equipment commonly used by persons with disabilities to achieve access, unless doing so would result in an undue burden or adverse competitive impact.

(D) DEFINITIONS

"(i) UNDUE BURDEN.--The term 'undue burden' means significant difficulty or expense. In determining whether the activity necessary to comply with the requirements of Paragraphs (A), (B), and (C) this paragraph would result in an undue

burden, the factors to be considered include:

"(1) The nature and cost of the activity.

"(2) The impact on the operation of the facility involved in the manufacture of the equipment or the deployment of the network service.

"(3) (I) The financial resources of the telecommunications equipment manufacturer or telecommunications carrier;

(II) the financial resources of the manufacturing affiliate of a bell operating company in the case of manufacturing of equipment, for as long as applicable regulatory rules prohibit cross-subsidization of equipment manufacturing with revenues from regulated telecommunications service or when the manufacturing activities are conducted in a separate subsidiary.

"(4) The type of operations of the telecommunications equipment manufacturer or telecommunications carrier.

"(ii) ADVERSE COMPETITIVE IMPACT.--In determining whether the activity necessary to comply with the requirements of Paragraphs (A), (B), and (C) would result in

adverse competitive impact, the following factors shall be considered:

"(1) whether such activity would raise the cost of the equipment or network service in question beyond the level at which there would be sufficient consumer demand by the general population to make the equipment or network service profitable; and

"(2) whether such activity would, with respect to the equipment or network service in question, put the telecommunications equipment manufacturer or telecommunications carrier at a competitive disadvantage. This factor may be considered so long as competing telecommunications equipment manufacturers and telecommunications carriers are not held to the same obligation with respect to access by persons with disabilities.

"(iii) **ACTIVITY**.--For the purposes of this paragraph, the term 'activity' includes--

(1) the research, design, development, deployment, and fabrication activities necessary to comply with the requirements of this section; and

(2) the acquisition of the related materials and

equipment components.

"(E) Throughout the process of developing regulations required by this paragraph, the Commission shall coordinate and consult with representatives of individuals with disabilities and interested equipment and service providers to ensure their concerns and interests are given full consideration in such process.

"(F) REVIEW OF STANDARDS AND REQUIREMENTS.--

At least once every 3 years, the Commission shall conduct a proceeding in which interested parties shall have an opportunity to comment on whether the regulations established under this paragraph have ensured that telecommunications equipment or advances in network services and information services are accessible and usable by individuals with disabilities.

"(G) EFFECTIVE DATE.--The regulations required by this paragraph shall become effective 18 months after the date of enactment of this subsection.

RATIONALE FOR AMENDMENT 1

This amendment is based on the language currently contained in H.R. 3626. It is intended as a substitute for the language contained in (Sec. 229)(d)(4) of S. 1822.

Significant barriers continue to impede access by individuals with various disabling conditions to many common forms of information, as well as to specific telecommunication technologies. If effective, specific standards are not imposed to govern development of the information superhighway, then access for and use by people with disabilities will be spotty at best and virtually absent at worst.

The disability community believes that S. 1822 offers the best opportunity to extend the access requirements currently contained in H.R. 3626 to all players in the huge and growing telecommunication industry. The proposed Sec. 229 in S. 1822 already includes the framework around which a broader disability access requirement could be built. It is in the public interest to ensure that all sectors of the telecommunications industry address the access needs of individuals with disabilities when developing, designing or fabricating telecommunications equipment, networks or services. We believe that the FCC should be responsible for setting the standards rather than allowing access provisions to be fragmented between the FCC and the states. In short, if the Regional Bell Operating Companies can agree to manufacture telecommunications equipment and design network services to be accessible to

people with disabilities (as required in H.R. 3626), there is no compelling reason why all other players in the industry cannot meet this reasonable goal.

This language is a compromise which establishes the principle of full access along with the inclusion of exemptions for circumstances where access cannot be provided because of an undue burden or adverse competitive impact.

AMENDMENT 2.

OFFERED BY

TO S. 1822

(Page & line nos. refer to Bill as Introduced, 2/3/94)

Sec. 103(b)

Page 15, at line 3, insert the following:

(3) ensure that such advanced telecommunications services are accessible to and usable by individuals with disabilities.

RATIONALE FOR AMENDMENT 2

This amendment is intended to ensure that advanced telecommunication services provided to schools, health care institutions and libraries are accessible to and usable by people with disabilities. If these institutions are to be the first tier in providing enhanced services to Americans, it is essential to ensure that access to Americans with disabilities is built in from the beginning.

AMENDMENT 3.

OFFERED BY

TO S. 1822

(Page & line nos. refer to Bill as Introduced, 2/3/94)

Proposed Sec. 104

Page 15, at line 4, insert the following:

SEC. 104. NEW OR EXTENDED LINES.

Section 214 of the Communications Act of 1934 is amended by adding at the end the following new subsection:

"(e) Any application filed under this section for authority to construct or extend a line shall address the means by which such construction or extension will meet the network access needs of individuals with disabilities."

RATIONALE FOR AMENDMENT 3.

This proposed amendment is taken from H.R. 3636. This section would amend section 214 of the Communications Act of 1934 to require that a provider of telephone exchange service must address the means by which new or extended lines will meet the network access needs of individuals with disabilities.

AMENDMENT 4.

OFFERED BY

TO S. 1822

(Page & line nos. refer to Bill as Introduced, 2/3/94)

Page

Proposed SEC. ... VIDEO PROGRAMMING ACCESSIBILITY.

(a) INQUIRY REQUIRED.--The Federal Communications Commission shall, within 180 days after the date of enactment of this section, complete an inquiry to ascertain the level at which video programming is closed captioned. Such inquiry shall examine the extent to which existing or previously published programming is closed captioned, the size of the video programming provider or programming owner providing closed captioning, the size of the market served, the relative audience shares achieved, or any other related factors. The Commission shall submit to the Congress a report on the results of such inquiry.

(b) ADDITIONAL PROCEEDING ON VIDEO DESCRIPTION REQUIRED.--The Federal Communications Commission shall, within one year after the date of enactment of this section, complete an inquiry to examine the use of video description on video programming in order to ensure the accessibility of video

programming to persons with visual impairments, and report to Congress on its findings. The Commission's report shall assess appropriate methods and schedules for phasing video description into the marketplace, technical and quality standards for video description, a definition of programming for which video description would apply, and other technical and legal issues that the commission deems appropriate.

(c) REGULATIONS REQUIRED.--Within 18 months of the date of enactment, the Commission shall prescribe such regulations as are necessary to implement this section. Such regulations shall ensure that--

(1) video programming first published or exhibited after the effective date of such regulations is fully accessible through the provision of closed captions and video description, except as provided in subsection (e); and

(2) video programming providers maximize the accessibility of video programming first published or exhibited prior to the effective date of such regulations through the provision of closed captions and video description, except as provided in subsection (e).

(d) CONTENTS OF REGULATIONS.--Such regulations shall include an appropriate schedule of deadlines for the provision of closed captioning and video description of video programming.

(e) EXEMPTIONS.--Notwithstanding subsection (b)--

(1) the Commission may exempt programs, for which the Commission has determined by rulemaking that the provision of closed captioning or video description would be economically burdensome to the provider or owner of

such programming; and

(2) a provider of video programming or the owner of any program carried by the provider shall not be obligated to apply closed captions or video description where such action would be inconsistent with contracts in effect on the date of enactment of this Act, except that nothing in this section shall be construed to relieve a video provider of its obligations to provide services required by Federal law; and

(3) a provider of video programming or program owner may petition the Commission for an exemption from the requirements of this section, upon a showing that the requirements contained herein would result in an undue burden.

(f) **UNDUE BURDEN.**-- The term undue burden means significant difficulty or expense. In determining whether the closed captions or video description necessary to comply with the requirements of this paragraph would result in an undue economic burden, the factors to be considered include--

(1) the nature and cost of the closed captions or video description for the programming;

(2) the impact on the operation of the provider or program owner;

(3) the financial resources of the provider or program owner; and

(4) the type of operations of the provider or program owner.

RATIONALE FOR AMENDMENT 4.

Americans with disabilities, particularly those with hearing impairments and vision impairments, believe that the time is right to ensure that video programming is fully accessible. For too long, individuals with hearing and visual disabilities have been unable to benefit from significant portions of televised programming. In the new world of megachannel platforms (including channels to be used in schools) and video on demand, this lack of access will be magnified a thousand times. The barriers to access for these Americans are unnecessary and harmful; and they can be readily dismantled. Closed captioning and video description offer enormous potential for full access for individuals with disabilities and they also offer useful benefits to others in the population. Without a clear, unambiguous requirement for access to video programming through closed captioning video description, millions of Americans will be deprived of the benefits and enjoyment of the vast variety of video information and entertainment delivered via telecommunications networks to American households. As a consequence, these Americans will be asked to pay full price for video services while deriving only half the value.

There has been a significant increase in the amount of programming that has been closed captioned since the passage of the Television Decoder Circuitry Act of 1990. In particular, many network programs aired during prime-time are captioned. Similarly, video description serves a compelling national purpose by providing a

legitimate and essential means of access for blind and visually impaired Americans to video programming.

This proposed amendment would require the FCC to carry out inquiries into closed captioning and video description before proceeding to the development of reasonable standards for the accessibility of new video programming. Existing programming would be made accessible to the maximum extent possible.

For Sken
Herr

- call if you
have
questions

- Steve
66046

P.S. - I will get
you the disability
parts
ASAP

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THIS PAPER DOES NOT REFLECT THE VIEWS OF THE ADMINISTRATION, INDUSTRY OR ANY ONE FIRM. IT IS A DISTILLATION OF INTERVIEWS OF INDIVIDUALS WHO WORK TO PROMOTE ACCESSIBILITY WITHIN THEIR FIRMS.

By Steven Saleh

BACKGROUND

To be accessible to individuals with disabilities, the National Information Infrastructure, here must be a common data protocol at each stage of the information chain, a term defined as accessible interoperability. Audiotext and videotext information must flow unhindered through five types of players responsible for completing the digital loop.

	Player	Example
1.	Information Producer	Touchstone Pictures
2.	Information Provider	Disney Channel
3.	Information Transporter	cable, satellite, wireless, telephone wire infrastructure
4.	Network Access Provider	Delphi, America On Line
5.	Customer Premise Equipment	Television, Computer, Set-Top Box

At each of these steps the data protocol may require changes to be existing hardware and software, and new design elements need to be considered in the next generation of products. The greatest challenges an individual with a disability faces is interaction with the end user interface of equipment and software. It is there that the researcher focused most of his attention.

Customer Premise Equipment

Firms competing in the software/electronic appliance industries make decisions based on profitability, competitive advantage, and risk.

1. Firms decide to develop new features based on factors such as market size, and ability to complete product design with limited time and financial resources.
2. Though the disabled population is large, the audience size for features to address specific disabilities is smaller than other, more broad based features. Company

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strategy on this issue varies substantially. With an aging population, market potential for disability features is expected to increase. Most companies have yet to adapt the framework of universal design. Under this paradigm of business decision making, increasing accessibility to the community of individuals with disabilities also makes the products more accessible to able-bodied people.

3. Since the marketplace is extremely competitive as is the demand for new features, accessibility features have difficulty getting high or any priority within companies. Historically, the most effective way in raising priority is through legislation and regulation.

However, regulatory requirements must meet three goals. They must be broad enough to apply to current diverse technologies, effective enough to insure truly usable accessibility, yet flexible enough to not hinder the development of new technologies and applications.

When all players are required to develop features that meet user accessibility requirements, the chance of any one firm losing some degree of competitive advantage on other features is minimized.

4. Many areas of industry lack experience and expertise to define and implement accessibility features for their technologies. This is due in part to the absence of a sophisticated demographic ergonomic database available to industry. Other groups in industry, government, and the disability community have a level of expertise. Information sharing mechanisms are lacking and need to be developed.

Industry would benefit from the availability of independent testing organizations who could evaluate the accessibility of products under development. This would allow manufacturers to pinpoint specific improvements without the need to become experts in assistive technology.

5. All stakeholders must recognize that the standards needed to define levels of accessibility for new appliances are needed today and not 24 months from now. Steps need to be taken to speed up the process of developing standards.
6. All appliances need to have some capability to interface with people with disabilities. Currently, some appliances such as computers are at least partially configurable, but may be placed in settings where the user is prevented from configuring them. Many appliances such as ATM's are not configurable, so it is even more important to build a level of accessibility into them during manufacture.

MOTIVATIONS FOR DEVELOPMENT OF ACCESSIBILITY FEATURES

Governments's strongest influences in achieving accessibility to date has been

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availability of government research funding and legislation. Sources of research on human factors include NIDRR, and to a lesser extent, NSF.

1. Section 508 has historically been ineffective in motivating industry to build in accessibility features due to its spotty application and enforcement. Only in recent years have federal agencies begun including specific accessibility requirements in RFP's, and thus created the possibility of real financial risks for non-compliant companies. However, Section 508 only affects firms who sell to the government, especially in large quantities..

COCA has made substantial progress in defining language that includes coverage for most disabilities. However, there is concern that the goals of 508 will be eliminated in the process of reinventing government.

2. To date the American with Disabilities Act has been ineffective in insuring access to electronic appliances. This is because there is no specific coverage of electronic information systems in existing federal access guidelines. These guidelines have been the responsibility of the Access Board, technically known as the Architecture and Transportation Barriers Compliance Board.
3. The threat of loss of government business combined with the risks of breaking well enforced laws are strong drivers that would be effective in influencing the decision process of what features will be allocated resources.
4. Developing accessibility features is not considered a high profile job within the design culture, both within the companies and in the trade press. It is critical that steps are taken to recognize accessibility achievements. This could be another effective tool at raising the priority of these features.

SPEEDING UP THE PROCESS

To significantly speed up the process of developing accessibility features in new appliances, such as the set-top box, as well as existing appliances such as the computer, the following steps should be considered:

1. Develop standards from a user perspective on what makes an appliance accessible. This includes an demographic ergonomic database that helps define levels of accessibility
2. Establish target dates with associated levels of accessibility.
3. Insure that construction of accessibility features do not limit the development of creative technology.

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4. Consider the implementation of a joint stakeholders working group on accessibility features and the NII. The stakeholders would include industry, government, and representatives from the disability community.
5. Allocate R&D for the development of user accessibility standards of accessibility that can be adapted by industry. This is especially critical for emerging technologies such as animated, verbal, three dimension and virtual reality.
6. Detail the benefits and drawbacks of strategies to finance the cost of developing accessibility features. Possible strategies include: 1) passing cost to all consumers, 2) subsidy by the government, 3) passing costs on by the consumer who has disabilities or 4) funding by vendors themselves.
7. Address problems where existing copyright laws restrict the development of close captioning, translations, descriptive video, or simplified user interfaces for pre-existing materials.

July 21, 11:30 AM

Planning meeting for Aug. 4

1. Update on people attending (5 minutes)

36 invitations sent out, 8 confirmed to date

anticipated number of people attending (including IITF and White House) - 45

2. Discussion of meeting format, roles, and appropriate room set-up (20 minutes)

3. Handouts (5 minutes)

participant list

Putting the Information Infrastructure to Work: Report of the Information Infrastructure Task Force Committee on Applications and Technology

4. Additional meeting arrangements: (10 minutes)

sign language interpreter - completed

directions to meeting room, accessible restrooms

name tags

recording of meeting

availability of meeting transcript, related follow-up

response to media requests



Information Resources Management Service
 Clearinghouse on Computer Accommodation

Facsimile Cover Sheet

From:

Name: Susan Brummel
 Fax #: (202) 501-6269
 Phone #: (202) 501-4906
 Location: 18th & F St. NW
 Washington, DC. 20405
 Mail code KGDO Room 1234

To:

Name: Jan Allen
 Fax #: 456-7028
 Phone #: _____
 Location: _____

Total number of pages
 including cover: _____

Comments: _____

NII: An Investment in Americans with Disabilities

In a competitive global economy, our country does not have a single person to waste -- opportunity must be open to everyone... I believe our entire nation will share in the economic and social benefits that will result from full participation of Americans with disabilities in our society.

- President Clinton, 12/1/92

Part I: What Is the Application Arena?

On September 15, 1993, the Administration issued *The National Information Infrastructure(NII): Agenda for Action*, which formalized several federal NII policy development mechanisms and enumerated the guiding principles and goals for future policy development. A portion of the vision is as follows:

" A major objective in developing the NII will be to extend the Universal Service concept to the information needs of fundamental fairness, this nation cannot accept a division of our people among telecommunications or information "haves" and "have-nots". The Administration is committed to developing a broad, modern concept of Universal Service -- one that would emphasize giving all Americans who desire it easy, affordable access to advanced communications and information services, regardless of income, disability, or location."

The National Information Infrastructure: Agenda for Action addresses responsiveness to the usage requirements of people with disabilities as a founding principle. This "LEAD by Design" application approach will ensure accelerated progress toward the full participation of people with disabilities in society as envisioned by the Americans with Disabilities Act. The technologies that deliver for the NII will be the technologies that LEAD the way in Liberating Expressiveness, Amplifying Dignity for all Americans.

Description of LEAD by Design

Ensuring that the NII accommodates the rights of people with disabilities to equitable communication and information access amplifies innovations and economic returns from national investment in the NII. Federal, state, and local investment activities underway today are demonstrating that accommodating people with disabilities is finally gaining recognition as a driving force for advances in human and organizational performance overall. As this investment strategy gains momentum, information technology developers are weighing in on the broad-based, competitive advantages of this universal design approach, that readily accommodates individual needs associated not only with disability, but also worker re-training, aging, illiteracy, and high performance, critical mission information environments.

Americans with disabilities may represent the single largest consumer group already discussing among themselves and with industry and government how they envision the information infrastructure will work for them. Many people whose disabilities have previously restricted their access to printed information or communications are now high demand users of online services and articulate spokespersons on the benefits of these capabilities. It is anticipated that this pattern of high demand usage will continue as NII services unfold. Many people whose needs were not considered in the designs of previous information systems now have a direct voice and serve informally as representatives for the many additional people with disabilities who have yet to experience first hand the benefits of NII precursors, such as the Internet.

Historical and Current Evidence of the Benefits

Two of the world's most valuable information tools emerged from early efforts to accommodate people with hearing impairments and vision impairments. The typewriter was invented as a writing device for a blind member of a royal family. When Alexander Graham Bell was inventing a device to overcome communication barriers experienced by his wife due to hearing loss, he similarly never imagined how his invention would change how the people of the world communicate.

In a contemporary vein, one of the lead engineers of the original Advanced Research Projects Agency network (ARPAnet), the predecessor of Internet, was very accustomed to a text interface for communicating with his wife by telephone due to her hearing loss. His receptivity positively influenced the inclusion of text messaging as an application, although not originally planned for ARPAnet. Today the value of this e-mail capability to people around the world is beyond estimation.

Another ARPA originated technique - infrared-based eyetracking - has been matured and commercialized by a small business. This small business targeted individuals with severe disabilities as the first customers of this hands independent and body movement independent intelligent interface device. Today, this eye-tracking product is being sold around the world to a small, growing number of people with extensive mobility limitations.

This product, after being commercialized and matured by users who demanded high performance and reliability, is now being purchased by Federal and private sector laboratories. Oak Ridge Laboratories is exploring its use to control tele-robotic vehicles in hazardous environments. A number of usability laboratories world-wide have purchased a sister product that advances visual display designs through user performance measures. Efficient display of information is an important NII design consideration. A head mounted display incorporating eye-tracking is next; it will accommodate not only people with disabilities but anyone in high demand, high performance environments, including national security.

Speech recognition, a technology increasing in power and potential, also originated through ARPA resources. Quadriplegic individuals have become recognized by the speech recognition industry for the significant contributions they've made to maturing a technology that is destined to revolutionize human-computer interactions as a high performance threshold is reached. These pioneer users, without functional use of a keyboard, were driven not by device novelty, but by true performance demands and dependence on a technology to effectively interact with a computer.

Another powerful telecommunications advance was spearheaded recently by a person with a profound hearing loss who worked with an engineer to overcome her dependence on text telecommunications. The resultant product is elegant in its simplicity and cost effectiveness. With this product, she is able to use both standard and cellular phones directly. All amplification is provided by her existing hearing aid. The long term benefits and value of this technology to the segment of the hearing impaired population around the world and their communities of interest may be inestimable. The cost per unit is approximately \$80. This technology will also minimize the consequences of age-related hearing loss and its inconveniences and indignities.

Federal Evidence of Benefits

The General Services Administration, Clearinghouse on Computer Accommodation (COCA), has been tracking these little-known innovation synergies for a number of years and through the Congressionally chartered Federal Laboratory Consortium for Technology Transfer has recently begun serious discussion with the Army Research Laboratory and other labs that exhibit strong interest in technology transfer and dual use high performance interfaces.

COCA became aware of this innovation dimension during the past decade while assisting Federal agencies in identifying and shaping their investments in technology to accommodate people with disabilities. Public Law 102-569, Section 508, (1992 Amendments to the Rehabilitation Act of 1973) reflects this Federal policy.

As implementation of Federal accessibility statutes proceeds, Federal agencies are discovering that purchasing information systems that accommodate a wide range of user interface requirements promotes productivity and ensures access to work-related and public information by people with disabilities. Organizations are benefiting from the ability to recruit and retain quality employees and the ability to effectively interact with all clients, including those with disabilities.

Agency experiences with user interface options that incorporate maturing technologies such as speech synthesis, speech recognition, or infra-red technologies, also provide an effective means for evaluating near-term applications with potential benefit to all users. Many employees in hands busy, eyes busy, or noisy environments can benefit today from flexible interface alternatives that have already been adopted by people with disabilities. Applications with user interfaces that accommodate alternative displays

and keyboards are also being employed to minimize or prevent the visual fatigue and repetitive motion injuries associated with keyboard-intensive environments. As the work-force ages, accessible information environments will support the requirements of people who develop age-related limitations of vision, hearing, or mobility. As planning by the federal government increasingly reflects the total information infrastructure, LEAD by Design represents a solid foundation to maximizing the value of the evolving information systems and services.

LEAD by Design as an NII Innovation Driver

As awareness of disability-driven innovations becomes recognized, and societal dependence on technology for community participation and economic growth continues, this approach will become recognized as an innovation driver globally. E.H. Sibley summarizes this strategic opportunity:

"In reflecting on the problems of the multiple language and character sets faced by the world, it appears that a large portion of the potential computer user population is at a disadvantage. They must use difficult interfaces or learn another language. When we add up the cost of not having good input/output devices for the many people who can compute but find it cumbersome, we can conclude that the cost of efficient new devices would pay for themselves many times over. Particularly at a time when the world's political barriers are being removed, perhaps our new opportunity frontier should be to remove the barriers to computing for all humanity, be they different in language, representation, or device needs."¹

The recent report on High Performance Computing and Communications: Toward a National Information Infrastructure by the Office of Science and Technology Policy acknowledges this need. Addressing intelligent user interfaces, the report states, "A large collection of advanced human/machine interfaces must be developed in order to satisfy the vast range of preferences, abilities, and disabilities that affect how users interact with the NII."

The NII affords a unique opportunity in the design of human interface technologies to formalize collaborations among high demand user groups with a wide range of preferences, abilities and disabilities in order to reduce the lag time of technology transfers critical to continued growth and opportunity.

The Electronic Industries Foundation has reported that "manufacturers who have found ways to simplify the user interface have seen positive consumer response in terms of increased sales and decreased product returns... A growing body of research suggests that

¹E.H. Sibley, Communication of the ACM, May 1990

there are ways to design products that can accommodate functional limitations, and actually enhance their ease of use for everyone." ²

The use of generic performance benchmarks such as the following developed by Pirkl and Babic (1988) would stimulate the design excellence needed to put customers first: 1) cross-sensory redundant cuing, feedback, and modes of operation, 2) reduced complexity of operations, 3) adjustable product/user interfaces designed for a variety of populations and accommodation levels and 4) designing beyond basic needs in a manner that enhances user's independence, self-respect, and quality of life.

These findings are congruent with the growing recognition that technological advance only provides a competitive advantage for a short time; superior design and manufacturing - doing it right for the customer and quickly the first time, ensures true economic advantage in a consumer driven, global economy.

What is the Public Interest in Investing in NII and People with Disabilities?

This section outlines how significant benefits are anticipated in at least five areas. The public will be particularly interested in how the NII : 1) removes communications and information access barriers that restrict business and social interactions between people with and without disabilities, 2) removes age-related barriers to participation in society, 3) reduces language and literacy related barriers to society, 4) reduces risk of information worker injuries and 5) enhances global commerce opportunities

Removes Communications and Information Access Barriers that Restrict Interactions Between People with and without Disabilities

There are approximately 49 million Americans with disabilities who will access the NII for communication and information activities. As the California Public Utilities Commission reports, affordable applications, low-cost customer equipment and consumer education and training will be critical determinants of the success and marketplace advantages of the NII.

An individual with limited mobility may not have easy access to public libraries, places of employment or business, or retail outlets. Although these facilities maybe "accessible" for the wheelchair user, getting to and from such locations often poses a serious challenge. Loss of hearing or sight are obvious barriers to information access.

The capacity to communicate with, and collect information from almost any point on the globe from one's home has already expanded the ability of persons with disabilities to participate in an information oriented society more effectively than ever before.

Federal policy promoting the coordination of a nationwide information infrastructure holds great promise of protecting the gains already made in information access by persons

²EIA Seal of Accessibility Development Plan Version 1.0 9/17/93

ith disabilities. However, if the design and development of the NII does not accommodate the technical requirements needed to provide universal access, then information utilization by persons with a variety of disabilities will be set back to the days before the development of computers.

At present, even without the development of a coordinated infrastructure, people with disabilities are carrying out electronic banking, shopping online, telecommuting, providing information services to others, all from their homes. In the office setting, via electronic document processing visually impaired and blind employees have access to vital information equal in some cases to their sighted colleagues. The economic impact of developing an information system that can not be accessed with the specialized systems needed to interpret the electronic information into a form that can used by a person with a disability, i.e., Braille displays, speech synthesizers, or voice input processors, will be far greater than the cost of building access capabilities into the infrastructure from its inception.

Adoption of universal/transgenerational design to meet the needs of disabled or older consumers promises to stimulate the deployment of applications that all consumers will value for convenience, customer choice and equal opportunity.

following text will be in sidebar:

There are many truths of which the full meaning cannot be realized until personal experience has been brought home. John Stuart Mill 1800-1873

Reduced Barriers to Full Participation in Society

I am a C7 quadriplegic who has completed a course in desktop publishing. I have been disabled for two years and very eager to get back into the work force. I have learned I'm still employable regardless of my disability. I recently learned about telecommunications and the different networks for communicating. With electronic mail I communicate with various people from all around the world. My life has really opened up with my career change and the electronic information systems.

Reduced Barriers to Business and Employment

I am a C5 quadriplegic living in the Silicon Valley and a current intern with the Networking and Communication Department. I have been disabled for ten years from a motor vehicle accident in 1983.

I use computer telecommunications daily in numerous different functions.

Telecommunications has opened up a new world, allowing me to communicate via e-mail with colleges, government agencies, and organizations.

The future success of telecommunications is phenomenal, especially for the disabled community. It not only allows a person unable to go out into the community to access

endless amounts of information, but also permits disabled persons, such as myself, to eventually return to the workforce (via telecommuting) and become productive citizens again.

I have a dream of some day starting a nationwide bulletin board for attendant care for the disabled community. It would be an attendant registry that would permit disabled persons to hire attendants anywhere in the United States and find qualified and compatible employees.

Reduced Communication Barriers

I am 17 years old. I am an oral, profoundly hearing-impaired student who is fully mainstreamed in the 12th grade at the Park School in Baltimore, MD. I did not really have access to e-mail until early October, when a friend of mine proposed that we e-mail each other...e-mail turned out to be easier than I thought, and it has been wonderful because it has enabled me to communicate with my friends from around the Atlantic Seaboard region.

The "electronic super-highway" is a boon for deaf/hearing impaired people because it enables them to communicate via the written word, which is a very effective alternate means of obtaining vital information in a relatively short period of time. It is my hope that the White House will make access to the information highway universal.

Thank you for allowing me to voice my concern regarding this matter. E-mail is such a wonderful thing and I am fortunate to be living in an age where communication opportunities (especially for the deaf/hearing impaired) are expanding.

Reduced Information Access Barriers

I am using e-mail everyday on campus at Gallaudet University, and because of my social shyness, it is much easier for me to socialize on the keyboard. I also find it great for research, and am doing my best to learn about Internet services as quickly as possible. I have been hard of hearing since birth, 50db equilaterally.

Reduced Barriers to the "Basics" in an Information Society

Rodney, a senior at Rogers High School, Puyallup, Washington, has no use of his arms or legs and uses a mouth wand to operate a computer. He began using a computer at age 6, and learned to read and write in this manner.

When asked a question, Rodney balances his wand on a box strategically placed near his terminal. A computer he says "is sort of like running water. You don't know what you'd do without it."

end side-bar

Removes Age-related Barriers to Participation in Society

According to the U.S. Bureau of the Census, by the year 2000, the U.S. population of those over 65 years will be greater than 34 million, this figure world wide is over 419 million. The Bureau projects that in the next 50 years, the U.S. population will increase overall by 19.8 percent; however, the population of those 65 years or older will increase by 117 percent, more than doubling from 31.6 million to 68.5 million. By designing the NII to meet the needs of people with disabilities, the NII will also have the flexibility and competitive advantage of accommodating the freedom of choice and independence desired by this unprecedented number of older people. A well-designed NII that accommodates a wider range of vision, hearing, and mobility differences will normalize and not stigmatize our aging society. The personal and economic loss associated with past age-discriminatory designs can be eliminated and this transgenerational design of the NII will likely offer global advantages.

The NII will increasingly be a key factor in the independence, productivity, commerce, and community participation of a significant percentage of older people in our society. Those over the age of 50 control over 50% of America's discretionary spending funds (Ostroff 1989), and those over 65 control 77% of all assets (Pirkl and Babic 1988).

Reduces Language and Literacy Related Barriers to Society

Full implementation of the Television Decoder Circuitry Act of 1990, will ensure not only full access to broadcasting by deaf Americans, but will also provide the text captioning that may serve as one of the most powerful tools in this country and world-wide to alleviate economic stagnation associated with illiteracy. According to the most comprehensive literacy study ever done by the U.S. government, the literacy levels of 90 million people in the U.S. is deficient.³ According to the study, nearly half of all adult Americans read and write so poorly that it is difficult for them to hold jobs, thus presenting a direct threat to the U.S. economy. A third significant benefit of television with text captioning will be its usefulness as an effective learning technique for English as a Second Language.

Reduces Risk of Information Worker Injuries

With 70 million personal computers in use, strain injuries have skyrocketed. The U.S. Department of Labor figures show repetitive stress injuries represent 60% of all job-related illnesses. Estimates of the annual cost to business is \$20 billion.⁴ Pilot demonstrations of speech recognition for all workers are underway in several private sector companies as a strategy to increase productivity and decrease keystrokes. Again, pioneer users of this technology have been people with disabilities. NII applications will

³U.S. Department of Education, National Center for Education Statistics, National Adult Literacy Survey, funded by federal and state governments

⁴Smithsonian, June 1994

interoperate with intelligent user interfaces accommodating a wide range of user needs and preferences such as speech interfaces.

Enhances Global Commerce Opportunities

There are approximately 750 million people with disabilities in the world. Meeting the needs of people with disabilities in the NII will provide U.S. companies an early competitive advantage to addressing similar market needs globally.

The global advantages of the increasing U.S. market responsiveness to people with disabilities was noted in the 1993 report of the Commission of the European Communities. The report, *European Technology Initiative for Disabled and Elderly People - Call for Proposals*, states as follows:

"Technology transfer from the major European Information Technology industry to the Small and Medium-sized Enterprises, with the knowledge of the customer, will be critical to the competitiveness of the European Rehabilitation Technology industry. This technology transfer opens new markets for European technology. It also helps counter the threat posed to European industry by US legislation in favor of people with disabilities which is both forcing the Information Technology industry to take their needs into account and stimulating a strong rehabilitation technology industry in the US."

Deploying technologies such as real-time captioning, originally developed to accommodate deaf individuals could also enhance international commerce activities. For example, U.S. economists working on General Agreement on Tariffs and Trade (GATT) spent many hours transcribing and comparing notes from working sessions before strategizing on next steps. Delegates with limited English proficiency may experience even greater difficulties processing meeting content when it is only presented in spoken English. This situation may tend to increase misunderstanding and decrease trust, resulting in costly negotiation delays. Deploying real-time captioning would provide all delegates with a written English transcript of the proceedings at the end of the meeting. The captioning equipment would also provide to the entire group a real-time text display of the speaker's words that would serve to enhance language comprehension by delegates with limited English proficiency.

The technical solutions employed today to magnify text displays for low vision users are identical to solutions being evaluated in Saudi Arabia to make English software applications readily translatable to Arabic. This approach can be applied to any foreign language to reduce barriers to market entry by U.S. software developers.

Part II - Where are We Now?

This section addresses the emerging consensus on universal design and convergence of policy and design practices in both the public sector (federal, state, foreign governments) and private sector that are becoming examples and support mechanisms for NII applications that will LEAD by Design.

National Laws and Policies

Since 1988, statutory requirements for Federal agencies have been in place to ensure that agency investments in information technology integrate requirements to ensure that the needs of people with disabilities are met. This policy is based on two laws, Pub.L. 100-542 and Pub.L. 102-569. Pub.L. 102-569, Section 508 addresses the requirement that Federal investments in information technology be conducted in a manner that ensures access to computer and telecommunications products and services by employees with disabilities and citizens with disabilities accessing public information services. Pub. L. 100-542, the Telecommunications Accessibility Enhancement Act, mandates a proactive approach within the government to advancing accessibility to the Federal telecommunications system by individuals with hearing or speech limitations.

These laws do not represent a radical new direction for Federal agencies, but serve to reinforce existing mission requirements under the Rehabilitation Act of 1973. This Act requires federally conducted or federally sponsored programs to be accessible to persons with disabilities and mandates that management policies must not discriminate in the hiring, placement, and advancement of persons with disabilities.

The Americans with Disabilities Act of 1990 (ADA) has adapted and extended many of the existing responsibilities of the Rehabilitation Act of 1973 for implementation outside the Federal government. The law requires barrier-free access to places that serve the public, such as theaters, restaurants, and museums. State and local government services, transportation, and telecommunications services must also be accessible. Discrimination on the basis of disability in private sector employment is also prohibited.

Protecting the rights of access to the evolving information infrastructure by customers with disabilities is a national responsibility as a result of the Americans with Disabilities Act. As implementation of ADA continues, accessibility to the information infrastructure represents an important area for Federal, state and private sector sponsored pilot demonstrations to conduct performance benchmarks and showcase early benefits and successful implementation strategies.

Efforts of Federal Agencies

General Services Administration, Council on Accessible Technology

In 1984, GSA created an interagency committee that is now called the Council on Accessible Technology. The Council, comprised of senior executives from 30 agencies, promotes the planning and investment in information infrastructure that demonstrates the flexibility to accommodate people with disabilities.

The Council advances the new business practice of including persons with disabilities in the design, pilots, and early implementation of all new agency information infrastructure investments.

Last Fall, the Council co-hosted with the Department of Commerce a seminar entitled "Universal Design: Accommodating Diversity and High Performance". The seminar was attended by approximately 200 people from Federal and state governments and industry. The seminar took place in conjunction with the Department of Commerce' Sixth Annual Accessible Computer Technology (ACT) Exhibit.

At the Department of Commerce' Seventh Annual ACT Exhibit, on Oct. 5/6, 1994, the Council will be showcasing Federal, state, and private pilot demonstrations of applications that showcase how the needs of people with disabilities can be met in the NII. COCA will assist in pre-selection of applications that meet existing accessibility guidelines.

The Council will conduct a similar showcase of NII applications that are usable by people with disabilities at the Interchange '94, October 12/13, 1994.

General Services Administration, Clearinghouse on Computer Accommodation (COCA)

Since 1984, the GSA Clearinghouse on Computer Accommodation (COCA) has served as a model demonstration center for advancing accessible information environments, services, and management practices in order to stimulate the governmentwide capacity-building needed to meet statutory requirements. The center provides technical consultation, presentations, training, and assistance to federal agencies. The center also serves as a pilot demonstration site and market need/market utilization conduit between federal agencies and labs, universities and industry.

COCA facilitates a network of federal employees with disabilities and their support personnel that provides early customer feedback on new service delivery technologies and practices. Liaison with COCA and this network, the Computer/Telecommunications Accessibility Resource Exchange (CARE), is now a part of many agency programs. CARE members piloted with GSA developers, the first accessible information kiosk. GSA continues to advise and provide accessible kiosk services to customer agencies.

COCA is currently working with Government Printing Office, National Institute on Standards and Technology, and Internal Revenue Service to promote investment in electronic document services that are accessible.

COCA provides guidance on developing accessible CD-ROMs and is developing a tutorial to assist blind users in graphical user interface environments..

COCA is assisting pilot development and demonstration efforts to ensure that Mosaic, a powerful Internet browsing capability is fully usable by people with disabilities. COCA gave a presentation recently at the Mosaic Federal Consortium hosted by the National Center for Supercomputing Applications, University of Illinois, Urbana-Champaign.

Last summer, COCA piloted a program that through summer student employment provided an early education opportunity to future human interface designers about the government's need for an accessible information infrastructure. Stanford University participated and inquiries for future participation were received by Georgia Institute of Technology and Harvard University, Kennedy School of Government.

COCA recently hosted a productive demonstration/consultation led by a COCA computer specialist who is blind. Participants included representatives from a university, Federal laboratory, business consortium, and human interface developer who was piloting a new speech interface. This meeting was a model for future collaborative partnerships needed among these communities of interest.

Due to changing research priorities, federal laboratories committed to dual use technology and high performance technology are also beginning to approach COCA to discuss collaborative efforts. In this manner, market demand will be stimulated for alternative modes of computer interaction, needed by persons with disabilities and originating from federal labs (speech input/output, infra-red, and other human interface technologies). The synergistic goals of dual use technology and accommodation of diversity can be achieved. It is anticipated that this technology push initiative will be complemented by a market pull within the labs for user interfaces that offer greater flexibility to accommodate a wider range of abilities, disabilities and preferences.

**Department of Veterans Affairs
Microcomputer Training Program for Persons with Disabilities (MTPPD)**

(MTPPD) serves persons with disabilities within and outside the Department. MTPPD also supports the Department's Nationwide Office Automation for the VA (NOAVA) implementation to ensure that employees with disabilities receive equal access to NOAVA OA systems and platforms.

The MTPPD program also provides training to employees within the VA and from other federal agencies. The cost-reimbursable training addresses both adaptive technology and common application packages. Other program services include consultations, tours, equipment demonstrations, and product evaluations. Document scanning and converting services, including braille, are available to agencies on a cost-reimbursable basis.

Department of Commerce, Committee on Resources for Electronic Accessible Technology to End Users (CREATE)

CREATE is the vehicle responsible for planning and coordinating Department-wide activities in increase awareness of accessible technology issues and explore ways to ensure that the information environment is usable by people with disabilities. CREATE hosts the Accessible Computer Technology Exhibit hosted annually in October to increase awareness and effective use of commercially available products and services that accommodate people with disabilities.

**Department of Agriculture (USDA)
Technology Accessible Resources Gives Employment Today (TARGET) Center**

The Accessible Technology Program has established the TARGET Center to support USDA employees nationwide and other Federal agencies. TARGET provides evaluations, demonstrations, resource information, needs assessments, and training on accessible technology. The center uses opens systems concepts to highlight accommodation solutions available on personal computers. TARGET demonstrates how accessible technology optimizes productivity and job retention of career employees by reducing worker compensation costs and disability retirements from end-user computer injuries.

**Department of Defense
Computer/Electronic Accommodations Program (CAP)**

The CAP Office assists DoD activities to procure adaptive equipment which provides access to computer systems and telecommunications as required by Public Laws 102-569 and 100-542. The CAP Office provides technical, educational and financial support to assist employees, supervisors and managers identify and procure appropriate accommodations. The CAP Office conducts special projects to assist DoD activities to ensure an accessible work place. Projects include working with DoD components to ensure that training centers, libraries, and programs are accessible; and coordinating with system acquisition activities to ensure that accessibility is considered in the procurement of DoD systems. CAP also established the Technology Evaluation Center (CAPTEC), a facility dedicated to the evaluation and testing of emerging technology. The CAPTEC assists DoD supervisors and employees in choosing appropriate adaptive equipment for creating work environments that are accessible to persons with disabilities.

**Internal Revenue Service
Computer/Telecommunications Accessibility Program (CAP)**

The Computer/Telecommunications Accessibility Program (CAP) was established to ensure that IRS makes electronic information accessible to people with disabilities. CAP assists the managers and employees in selection and procurement of appropriate adaptive technology. The CAP office works with acquisitions and procurement personnel to ensure

that accessibility is included in information technology procurements. CAP has a demonstration center with adaptive equipment.

**National Security Agency
Center for Computer Assistive Technology (CCAT)**

(CCAT) provides demonstration of assistive technology devices and professional resources for agency employees with hearing visual or physical limitations. The goal of the center is to provide assistance and identify alternative solutions for persons with disabilities.

Federally Sponsored Activities

Department of Education, National Institute on Disability and Rehabilitation Research (NIDRR)

Technology-Related Assistance Act Funded States

In 1994, Congress re-authorized Public Law 100-407, the Technology-Related Assistance For Individuals with Disabilities Act (Pub.L.103-218). Administration of the law continues to be conducted by the NIDRR. To date 49 states, Puerto Rico, the District of Columbia and American Samoa have received grants for "systems change" activities to eliminate barriers that impede information and acquisition of assistive technology services and devices through implementation of consumer-responsive systems.

Project Enable, West Virginia Research & Training Center

Project Enable is a full featured computer bulletin board system providing information on disability, rehabilitation, employment, and education. It is used primarily by people with disabilities and their families, educators, students, and rehabilitation workers who participate in over 150 special interest discussion groups.

Rehabilitation Engineering Research Center (RERC) on Communications and Information Technology Access, Trace Center, University of Wisconsin, Madison

The Trace RERC studies access problems of people with disabilities to computer and information systems, and disseminates information on solution strategies.

Trace works with computer manufacturers and software producers to outline how existing products can be made more accessible to people with disabilities.

National Science Foundation

DO*IT (Disabilities, Opportunities, Internetworking, and Technology), University of Washington

DO*IT enables high school students with disabilities to explore careers in science, engineering, and mathematics through "mentorships" conducted via internet with practicing engineers and scientists from around the world, many of whom also have disabilities.

Selected Non-profit and Academic Activities

Project EASI (Equal Access to Software and Information)

Provides assistance to higher education in developing computer support services for people with disabilities. Project EASI provides information and guidance on campus applications of adaptive computer technology for access to information, instruction, research, and employment. Project EASI's Internet server hosts an active discussion about computer/telecommunications access issues.

WGBH- Caption Center, Boston, MA

WGBH has pioneered advances in accessible programming for more than 20 years since captioning the first nationally broadcast program. Today, employing 100 people they are working to make all programming accessible to the nation's 24 million deaf and hard-of-hearing viewers. Instrumental in the Television Decoder Circuitry Act of 1990, they also launched Descriptive Video Service(DVS) in the same year. DVS makes television accessible to millions of people who are blind or visually impaired through narrated descriptions of key program elements.

Corporation for Public Broadcasting/WGBH National Center for Accessible Media (NCAM), Boston, MA

NCAM was established in 1993 with funding from the Corporation for Public Broadcasting. NCAM has many projects underway to accelerate media access to populations that have been underserved or denied access. Project examples include: 1) Closed Caption University - empowering individual public television stations to caption their own programming 2) Access Primer and Toolkit - primers for stations interested in technology applications such as captioning, descriptive video, and foreign language (especially Spanish) translations and tips on building relationships with deaf, blind, and minority-language communities, 3) International Broadcasting - study of how countries around the world are providing access to their TV systems 4) Vertical Blanking Interval (VBI) Project is experimenting with using the VBI of the television signal instead of the third audio channel in routing descriptive video or Spanish video and 5) Print Access Project - to digitize newspapers and deliver them into the home fully accessible to blind, low-vision, and other print-disabled people.

World Institute on Disability

WID focuses on creation of public policy that will give people with disabilities access to the information age. WIDnet is a network that focuses on disability policy.

Stanford University, Center for the Study of Language and Information (CSLI)

CSLI's Archimedes Project works to improve access to information for individuals with disabilities by influencing the early design stages of tomorrow's technology. The project 1) applies basic research about information and communications to the design of access for people who are disabled and 2) educate those who will develop the next generation of technology about the advantages for the whole community of designing general access. In both instances maximum leverage is obtained by emphasizing design rather than retrofit.

Private Sector Activities

Disability Action Committee for Xwindows (DACX)

DACX is working to solve accessibility issues presented by the Xwindows graphical user interface. Membership includes the major Xwindows vendors including DEC, IBM, SUN, and representatives from academia. The purpose of DACX is to develop solutions which will allow users with disabilities to access systems running the Xwindows GUI. The group has succeeded in developing access utilities for users with motor impairments. It is also working on developing necessary "hooks" for screen reading programs. Access-related software developed by DACX is distributed through the Xwindows Consortium.

The International Committee on Accessible Document Design (ICADD)

ICADD promotes standards for producing documentation for "print disabled" individuals. Membership includes representatives from industry, academia, and government from many countries around the world. The purpose of ICADD is to develop and encourage the document transformations that print disabled persons are working toward. ICADD has succeeded in implementing accessibility in existing International Standards Organization (ISO) standards such as the Standard Generalized Mark-up Language (SGML)

Electronic Industries Association (EIA)

EIA- Consumer Electronics Group and the Electronics Industries Foundation (EIF) are currently working to create a Seal of Accessibility for consumer electronics products. When completed, the Seal will certify that designated mainstream products can be used by persons with functional limitations associated with aging, a temporary injury, or permanent disability, and that the products meet the accessible design guidelines established by a committee comprising manufacturers, disability experts, consumers, and representatives of organizations serving the needs of people with disabilities. The seal should help manufacturers during the design process and consumers during the selection process.

Industrial Design Excellence Awards (IDEA), Industrial Designers Society of America and *Business Week* Magazine

Promotes recognition of industrial design excellence as a strategic tool for competitiveness in the domestic and global marketplaces. Industrial designers make products easy to use, safe, comfortable, appealing, and ecologically responsible. One of the 18 gold medal winners for 1994 was James Pirkl, designer of a book on *Transgenerational Design: Products for an Aging Population* which highlights the marketplace advantages of well-designed products that also accommodate older people and people with disabilities.

International Activities

There are three major European program efforts underway to accelerate the productive application of technology on behalf of people with disabilities. The largest of the three is Technology Initiative for Disabled and Elderly (TIDE). TIDE is a community research and development initiative in the field of rehabilitation technology designed to stimulate the creation of a single market in Europe and to assist elderly and disabled people to live independently and to participate more fully in the social and economic activities of the community.

The main goal of the RACE program is Research and Development on Advanced Communication in Europe with the special aim to develop technology and infrastructure in order to prepare for the introduction of broadband network services and to promote European industry competitiveness in this field. This activity includes delivery of services to the largest possible cross-section of the user population, including people with disabilities. The project includes development of a standard reference manual of specifications for designers that will provide the necessary knowledge about human factors to ensure accessibility to all users of the integrated broadband communication network.

Member States of the European Union recognize the importance of education, employment and accessibility for people with disabilities. Institutions of the European Union have issued resolutions to promote equality of opportunity and integration of people with disabilities.

Canada's information infrastructure planning has also begun to address integrating the needs of people with disabilities. Canadian representatives have requested information about U.S. plans.

Part III: Where Do We Want To Be?

Information, which will be education, which will be employment, which will be income, which will be possibility, must flow to all Americans on terms of equal accessibility without regard to physical condition. And we are committed to doing that.

- President Clinton 5/13/94

This section addresses examples of important NII capabilities needed to address the national goal of equal accessibility in communications, commerce and community among people with and without disabilities. The examples are grouped under the four functional capability areas identified in the *Vision for a 21st Century Information Infrastructure* report of the Council on Competitiveness: 1) widely accessible and interoperable communications networks, 2) digital libraries, information data bases and services, 3) information appliances and computing systems and 4) trained people to build, maintain, and operate these resources. This May 1993 report envisions:

"The information infrastructure of the 21st century will enable all Americans to access information and communicate with each other easily, reliably, securely and cost-effectively in any medium - voice, data, image or video - anytime, anywhere."

Widely Accessible and Interoperable Communications Networks

- o Expectations of business owners with disabilities will be met for commerce, information, health, and manufacturing networks that offer the visual and auditory redundancy needed to accommodate their preferred modes of communications and information processing in a manner that is also transparent to and convenient to their customers.
- o Parent and community expectations will be met that education networks will accommodate the needs of parents, children, and teachers to have alternative modes of communication and information sharing available to accommodate situations when one or more of the communicating parties has a disability associated with hearing, seeing, or speaking. For example text messaging might substitute for telephone conversations between a parent and teacher. Multi-media learning applications would support redundancy options allowing student choice of information presented either visually or auditorially/tactile or both.
- o Accommodating people with disabilities will be a tangible and widely recognized citizen benchmark for responsive and respectful service. Citizen expectations will be met for equal access and improved services at all levels of government service delivery. For example, 911 emergency service calls will accommodate text telephone users who are deaf or speech impaired.

o Citizen expectations will be met that the enhanced service/routing features on 800 - number arrangements will accommodate people with disabilities by detecting text telephone users and routing their calls to a data server when voice telephone calls to the same number are routed to a recorded voice response unit. 800 numbers placed to an information service agent would automatically patch to the nearest state relay operator service if the agent failed to respond with a device capable of communicating directly to a text telephone.

o The 800 number service capability will also provide in a similar manner an automatic linkage option to the language translation services industry when needed by a caller or information services agent to complete a communication transaction when a common language is not available to the two parties.

o Citizens' expectations will be met that the large federal investment in federal laboratories and the technology transfer and dual use programs will contribute to advanced communications and information services that are designed to accommodate all user needs. This will be achieved through the Federal Laboratory Consortium and other organizations.

o Expectations will be met by hearing impaired and speech impaired executives that their requirements for real-time captioning through text or sign language inserts will be available in standard video conferencing environments. Again this capability will also accommodate conference participants experiencing foreign language barriers. Blind participants will be able to receive transmitted text by Braille or text to speech device if desired.

o Participants in courtroom proceedings including judges, jurors, and attorneys will be accommodated as requested using the suite of services described above to accommodate hearing loss, vision loss, or language differences.

o Expectations will be met that wireless voice and data service offerings and equipment will accommodate people with disabilities in a manner that represents a significant improvement from what is commercially available today in terms of interoperability, competitive offerings, and user customization options.

o Expectations will be that the access component between the customer premises equipment and the user with a disability will be designed with as much care and attention to flexibility and interoperability as the access component between the customer premises equipment and the transport carrier.

o Expectations from current users with disabilities that uninterrupted access to existing network utilities and services will continue as the technologies advance. This currently includes Electronic mail (video mail, multimedia mail, etc.), Directory service, Security service, Electronic commerce, and Bulletin board systems.

o Expectations that students with auditory or visual limitations will also be to benefit from the commercially prepared multi-media and "real-time video" capabilities employed for individual and group learning.

o Expectations from community members that electronic town meetings and government provided kiosk services accommodate full participation by all.

o Expectations from blind members of the community as well as those learning English that descriptive video services would become commonplace. Descriptive video services provide a spoken description that accompanies visual events.

Digital Libraries, Information Data Bases and Services

o Federally funded activities of the High Performance Computing and Communications Program, will address the needs of people with disabilities to uses these services and include people with disabilities in their pilot projects. This includes projects such as NSF funded digital libraries research, NASA developed prototype digital libraries, ARPA funded hypermedia systems with intelligent user interfaces and NIH developments in medical date-base management.

o Expectations of people who are print-handicapped due to vision problems or problems handling printed materials due to dexterity limitations will be met. These members of society will be able to access all publicly and commercially available electronic information services.

o The Government Printing Office "Access" Act of 1993 will lead to services usable by people with disabilities that include: 1) an electronic directory of federal electronic information 2) on-line access to the *Congressional Record*, the *Federal Register*, and other appropriate publications and 3) an electronic storage facility for federal electronic information.

o Expectations of retirees for intensive, early, and satisfied users of NII education, commercial, and leisure applications will be closely tied to the ease with which their age-related needs for large print, amplification, and speech-based interfaces are met.

Information Appliances and Computing Systems that are Easy to Use

o Expectation that information appliances or customer premises equipment that used to include only telephones, PCs/workstations, fax machines, optical character scanners, LANs, modems, video equipment, cellular phones, pagers, personal digital assistants, and notebook/laptop computers will now also include braille displays, braille computers, alternative keyboards, captioning systems, closed circuit televisions, CD-ROM drives, text telephones, text-to-speech devices, voice recognition systems, augmentative communication devices, assistive listening devices, and wireless personal communication services.

o Expectation that end to end telecommunications service will deliver to people with disabilities and include not only transport service, but also equipment and software needed for end to end connectivity. These services will offer user preference of modality or combination of modalities in which to present information or communication including: 1) voice-oriented 2) Data-oriented 3) Video-oriented (including video conferencing) 4) multi-media oriented and 5) wireless based.

o Older Americans will not be resistant to change as sometimes predicted if new appliances accommodate age-related vision, hearing, or dexterity limitations through better designed technologies than are available today.

o The capability to accommodate people with disabilities will be recognized as an essential performance measure during selection from among competing appliances. This benchmark will ensure the flexibility needed to access all communications networks and services and also accommodate learning preferences, noisy environments, hands busy environments, and high performance environments, including national security.

o Expectation that executives with disabilities while on travel will be able to secure an equivalent level of access to information and communication services as their non-disabled colleagues through well-designed information services such as kiosks, e-mail, and FAX-on-demand.

Trained People to Build, Maintain, and Operate these Resources

o Expectation that designers will invite people with disabilities to be beta users of all new products and service offerings recognizing that this class of user is both more demanding of functionality and more likely to quickly adopt a capability that offers real advantages. This design approach has unfailingly promoted greater ingenuity and innovation for many years, however, it has not well known or consistently applied until recently.

o Expectation that designers with disabilities are more likely to stimulate increased design foresight in their organizations.

o Expectation that businesses who offer only special customized products and services to meet needs of people with disabilities in a manner that addresses this requirement as an afterthought will be at a distinct disadvantage to businesses fully integrating the needs of people with disabilities early through universal design and pilot demonstrations that include people with disabilities.

o Businesses will advertise that their products and services are "access-screened" in a manner similar to being "green" or environmentally conscious. Perhaps a AAAS rating for "Application Adequacy for Accessibility Services" or a Seal of Accessibility as advanced by the Electronics Industry Association.

o **Businesses will expect federal pilot demonstrations to demonstrate how the accessibility of products and services can be advanced in the NII. There will a strong emphasis on access performance and reliability benchmarks for universal design in public and private interoperability testbed labs**

o **Businesses will expect opportunities to showcase how they are investing in universal design to competitive advantage.**

Part IV: How Are We Going To Get There?

This section addresses the scaling opportunities afforded through the NII to establish the leadership, policy and marketplace roles and alliances necessary to ensure that the design of the NII will meet National expectations for advances in commerce, communications, and community.

Strengthen Market Pull -Current Effort Level Can Not Ensure Uninterrupted Access

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Although the Federal government in its role as a major employer and information technology consumer is taking steps to use its "buying power" to communicate to industry its need for information technology products and services that are usable by people with disabilities, this process must be scaled up in priority and include pilot demonstration activities in order to shape the capabilities needed earlier in the technology design cycle.

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Agencies are demonstrating progress in formulating access policies and meeting current employee accommodation needs; however, increased attention is needed on leveraging market demand to ensure long term uninterrupted access as future technologies are introduced and the information infrastructure proceeds. The current restricted usefulness of graphical user interfaces by blind users represents inadequate foresight in the marketplace to changing needs. A recent White Paper on the future of the government information infrastructure titled *Networking for a Reinvented Government: Federal Telecommunications Requirements and Industry Technology Assessment* needs to be strengthened in order to adequately address requirements of people with disabilities.

Unfocused technology push prevailing over market pull can potentially interrupt customer access during technology replacement and refreshment initiatives. Reliable and uninterrupted access can only be achieved when the broad range of user needs are identified early and consistently applied as performance benchmark in market competition. The current vulnerability to uninterrupted access is also dependent on the pace of adoption of open systems standards. In the absence of open systems, small businesses with access products are more dependent on the cooperation from large suppliers to ensure continued connectivity and interoperability of proven solutions in new environments. In this environment, equitable access in any setting can be quickly jeopardized, because it is not yet recognized in the market as an indisputable customer requirement.

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Industry champions for improved access within large computer companies report that they are actively seeking greater evidence that equitable access is a high priority customer requirement of the government's information infrastructure.

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Leadership by Example

Although the Federal government is commonly associated with "technology push" R&D funding, within the information technology arena, the Federal government also has a unique role as buyer for the largest and most complex information environment in the world. The ability of the Federal government to demonstrate technology foresight in the marketplace can have a significant impact on the quality of life of people with disabilities. This consumer foresight can accelerate the readiness of the U.S. information industry to respond to similar application challenges beyond the Federal marketplace and abroad. The Federal government should strengthen its investment commitment to design excellence in order to achieve not only equal access to NII by all Americans but to recognize the innovation incentive it provides to industry to better prepare for consumer interface demands globally.

The Office of Science and Technology Policy is currently providing an example of LEAD by Design by assessing how well a new White House information service can be used by people with disabilities, before it is demonstrated to the President and opened to the public. This action will signal - in a manner that echoes tapping on the Liberty Bell during the first transcontinental call - our national commitment to an information infrastructure that will deliver in terms of global competitiveness, in part, because it delivers in a manner that liberates the expressiveness and amplifies the dignity of all Americans.

New Roles and Alliances

Deploying the National Information Infrastructure (NII) in a manner that promotes universal service, access to government information, and technological innovation with performance benchmarks for customer choice, equal opportunity, and convenience will provide the needed context for the following actions:

- 1) Due to the high stakes requirements of people with disabilities, establish a citizen participation mechanism or use an existing capability such as Americans Communicating Electronically (ACE) to ensure that citizens with disabilities have the means to give input and feedback directly to NII planners and developers throughout the process. This is the NII category of customer with the greatest need and at the greatest risk for being well-served by the NII.
- 2) Establish pilot demonstration partnerships among 1) regional associations of people with disabilities 2) regional business innovation/industrial design consortiums 3) regional federal laboratory consortiums and 4) regional rehabilitation engineering centers.
- 3). Increase collaboration among committed individuals involved in next generation design within universities, industry, and Federal laboratories to provide the focused technology push to human interface technologies that will readily accommodate capabilities required by people with a wide range of preferences, abilities, and disabilities.

4). Increase collaboration among Federal, state and private sector organizations to operationalize performance benchmarks and showcase pilot demonstrations of infrastructure capabilities that also offer improved and uninterrupted access by people with disabilities.

5). Human interface technologies that accommodate a wide range of user needs will become recognized as a critical technology in the missions of the Federal High Performance Computing and Communications Program, the National Telecommunications and Information Administration, the Federal Laboratory Consortium and the Technology Reinvestment Project of the Advanced Research Projects Agency.

6). Increased educational opportunities for human interface designers to learn how to meet customer requirements for accessibility through university/industry/disabled community partnerships that improve industry foresight to this changing global need.

Incorporating the Needs of Americans with Disabilities in New National Legislation

How should the Communications Act of 1994 (S.1822) protect and advance universal service in a manner that more explicitly includes people with disabilities?

How should the Antitrust Reform Act of 1993 (H.R.3626) and the National Communications Competition and Information Infrastructure Act of 1993 (H.R. 3636) fully reflect public interest in universal design, in effect, an information infrastructure that explicitly "LEADS by Design (Liberates Expressiveness, Amplifies Dignity"?)

How should intelligent interfaces that accommodate disabilities and abilities be acknowledged as a competitiveness factor in the National Competitiveness Act of 1993 (S.4)?

Performance Benchmarks for Accessibility

How should the design needs of people with disabilities become operationalized as an integral aspect of all NII development initiatives? What performance benchmarking mechanisms are needed to ensure that innovations such as information kiosks, electronic town meetings, electronic voting and other interactive services can be fully utilized by people with disabilities?

How should the design needs of people with disabilities become an integral principle of ongoing federal programs advancing the NII such as the High-Performance Computing and Communications Program? What mechanisms are needed to coordinate and accelerate the technology transfer benefits between federal programs serving people with disabilities and High-Performance Computing and related advanced technology and technology reinvestment programs?

How should "LEAD by Design" application guidelines be integrated into the National Telecommunications and Information Administration grants program designed to support demonstrations of new telecommunications technology applications?

What mechanisms exist for regulatory agencies such as the Federal Communications Commission develop a program to communicate with disabled citizens on telecommunications issues?

Conclusion

Full participation by citizens with disabilities in the design, pilot demonstrations, and implementation of NII applications is a national priority. Collaborative support mechanisms exist within the federal and state governments and private sector to serve as communication conduits between citizens and NII developers. NII applications that LEAD by Design (Liberate Expressiveness, Amplify Dignity) will meet and exceed the expectations of the American people for advances in commerce, communications, and community.

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