IT R&D: Incorporating Accessibility for People with Disabilities

A Presentation by

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To the

President's Information Technology Advisory Committee

May 18, 2000

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

1. Education, OSERS, and NIDRR

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

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

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

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

2. Comments on the PITAC Report

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

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

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

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

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

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

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

We need to ask: "What does ***all*** mean in these paragraphs?"
It appears to mean everybody except certain groups.
Does *all* mean everybody except the blind, who that cannot use a Graphical User Interface (GUI)?
Does *all* mean everybody except individuals with a mobility impairment who can't use a keyboard and mouse?

Further, the report correctly notes:

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

and

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

and finally,

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

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

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

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

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

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

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

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

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

Innovation:

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

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

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

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

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

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

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

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

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

Changing Demographics:

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

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

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

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

Reducing the Potential for Future Federal Regulatory Intervention

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

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

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

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

5. Universal Design and Civil Rights Issues

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

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

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

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

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

6. Current Efforts to Provide Accessible IT

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

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

7. Conclusion and Recommendations

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

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

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

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

Recommendations

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

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

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

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

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

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

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

Thank you very much.

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7. Reference Web Pages

IT-Related Web Sites

Web Accessibility Initiative
http://www.w3.org/WAI/

Bobby Approved Web Site Tool
http://www.cast.com

Trace Center - IT Accessibility and Universal Design
http://trace.wisc.edu/

Access Board
http://www.access-board.gov/

The Association of Access Engineering Specialists
http://www.narte.org/AAES

Telecommunications Act of 1996, section 255(e)
http://www.fcc.gov/telecom.html

Television Decoder Circuitry Act of 1990
http://www.captions.com/circuit.html

Section 508 of the Rehabilitation Act
http://www.usdoj.gov/crt/508/508home.html

Background and Related Web Sites

Office of Special Education and Rehabilitative Services
http://www.ed.gov/offices/OSERS/

National Institute on Disability and Rehabilitation Research
http://www.ed.gov/offices/OSERS/NIDRR/

National Center for Dissemination of Disability Research

http://www.ncddr.org/

National Rehabilitation Information Center (NARIC)
http://www.naric.com/

Rehabilitation Engineering Society of North America
http://www.resna.org/

ABLEDATA
http://www.abledata.com/

Report on Computer use by People with Disabilities
http://dsc.ucsf.edu/UCSF/
Look for Report 13, Computer and Internet Use Among People with Disabilities, by H. Stephen Kaye, Ph.D.

Telerehabilitation
http://www.hctr.be.cua.edu/RERC/

Telemedicine
http:// www.tmgateway.org

Home Care Technologies
http:// www.hctr.be.cua.edu/HCTworkshop/HCTs_recom.htm