Interagency Committee on Disability Research
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Research Perspectives on Supporting Section 508 Compliance

Summary of Proceedings

Submitted by the U.S. Department of Education
Office of Special Education and Rehabilitative Services
National Institute on Disability and Rehabilitation Research (NIDRR)
On behalf of the Interagency Committee on Disability Research (ICDR)
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Contents

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Abbreviations

API	Application programming interface
ARIA	Accessible Rich Internet Applications
AT	Assistive Technology
AT/T	Assistive Technology and Technology Forum
CMS	Centers for Medicare & Medicaid Services
CPD	Centers for Persons with Disability
CSS	Cascading Style Sheet
DHS	Department of Homeland Security
ED	U.S. Department of Education
EIT	Electronic Interface Technologies
FCC	Federal Communications Commission
GOALS	Gaining Online Accessible Learning through Self-Study
GPII	Global Public Inclusive Infrastructure
HTML 2.0	Hypertext Markup Language Version 2.0
ICDR	Interagency Committee on Disability Research
ICT	Information and Communication Technology
ITTATC	Information Technology Technical Assistance and Training Center
IUI	Individual user interface
NCDAE	National Center for Disability and Access to Education
NIDRR	National Institute on Disability and Rehabilitation Research
OATTS	Open Access Tool Tray System
R&D	Research and Development
RtF-CCC	Crowd-sourced captioning in a rich text format
VA	U.S. Department of Veterans Affairs
VPAT	Voluntary Product Accessibility Template
WAVE	Web Accessibility Evaluation Tool
WebAIM	Web Accessibility in Mind

Executive Summary

Purpose

The purpose of the State of the Science Research Perspectives on Supporting Section 508 Compliance forum was to examine the state of the science, consider partnership opportunities, and promote interagency dialogue to explore solutions and the role of research to inform Section 508 compliance practices. Federal agency, advocacy, and private industry representatives dialogued with experts about critical Section 508 compliance issues and identified research needs and knowledge gaps on the following topics:

- accessible mobile applications;
- accessible collaboration technology; and
- assessment approaches for accessible technology.

Background

The Interagency Committee on Disability Research (ICDR) was established to promote interagency disability research coordination and collaboration, and enhance communication and information sharing among federal agencies and stakeholders conducting rehabilitation research programs and activities. The Assistive Technology/Technology Forum (AT/T) is a subcommittee of the ICDR.

Recognizing the complexities surrounding Section 508 compliance, the AT/T Forum began a series of meetings in Fall 2012, to discuss challenges and areas of need from a research perspective and to determine strategies and topics for ICDR to pursue to facilitate Section 508 compliance. Section 508 coordinators and subject matter experts provided valuable input to determine topics of interest and research needs.

As a part of the planning process, the AT/T Forum posed the following questions to prompt identification of research opportunities and needs:

- How can research help us do a better job at meeting the challenges of Section 508?
- What are the relevant technologies or technology trends?
- What tools would help with Section 508 compliance or would reduce the cost?

The group discussed that while there has been progress in improving technology accessibility, Section 508 compliance across the government remains difficult, requires extensive management, and can be expensive. Section 508 coordinators in the field indicated they would benefit from knowing how to use the tools that are available to evaluate accessibility; or develop content, tools, or products. One challenge of Section 508 compliance is sharing research and highly effective practices within the Federal government and using that research to inform improved accessibility practices.

Next they prioritized that list to determine the top three topics. Once they identified the most relevant and timely topics, the group nominated thought leaders and experts from the industry and academia who could inform a dialogue on these topics.

Format

Consistent with the ICDR authority to secure stakeholder input, the conference format included presentations from subject matter experts; responses by a Federal employees responsible for Section 508 compliance; discussions with participants; and responses by industry representatives. Following the presentations, participants broke into working groups to discuss key knowledge gaps and research needs. The presentation topics were accessible mobile applications; accessible collaboration technology; and assessment approaches for accessible technology.

Topic 1: Accessible Mobile Application. T.V. Raman, Research Scientist from Google, Inc., and an influential technologist, discussed trends and opportunities for incorporating accessibility into mobile applications. Dr. Raman's presentation predicted future technological evolutions moving toward a world of everyday things that are interconnected and mediated by technology. He challenged participants to consider how to ensure that this next generation of technology delivers on the promise of true universal access.

Topic 2: Accessible Collaboration Technology. Gregg Vanderheiden, Director of Trace Research and Development (R&D) Center, shared strategies for accessible telecollaboration systems and for incorporating accessibility into mainstream telecollaboration systems. He also discussed the need for strategies to allow individuals to access all of the different collaboration systems through personalization tools.

Topic 3: Assessment Approaches for Accessible Technology. Cyndi Rowland, Executive Director, WebAIM, discussed technical evaluation tools and processes; the human capital necessary for accessibility success; and data-driven tools for continuous improvement in web accessibility. She highlighted gaps in knowledge or practice and opportunities for future research and development.

A panel of industry respondents included Brian Cragun, IBM Master Inventor, and Susan Mazrui, AT&T Services Director of Global Public Policy. Both advocated that users with disabilities need to be a part of a collaborative solution, working with industry and the government to make the web and web tools accessible. In addition, they stressed the need for the Federal government to publish explicit accessibility standards so that the industry is clear about how the government will evaluate their products for accessibility.

Stakeholders voiced questions, concerns, and comments following each presentation. Participants included Federal 508 coordinators and specialists, and Federal stakeholders from over 20 agencies concerned with leadership, management, research, policy, program, and procurement. Stakeholders also included representatives from advocacy organizations, higher education, and industry.

Dividing into working groups, stakeholders dialogued on each topic area. Their task was to identify key knowledge gaps and potential research needs, and develop recommendations for the ICDR to promote this research agenda.

Themes

Several recurring themes emerged from the day's presentations and discussion:

Increase user influence. Users with disabilities are untapped resources who can be key influencers, spur innovations, and improve testing for accessibility. Collaboration with users can add valuable input and insights in design, development, and testing including: development of use cases, training design and delivery, active user input and opinion through crowdsourcing tools, manual testing of websites, and input into policies and standards.

Consider accessibility at the beginning stages to compile adaptable content and create new applications. Develop content so that data and information are accessible and adaptable for multiple platforms and devices. The rapid pace of technological development means that stand-alone devices and applications are obsolete soon after they are developed. Attention to accessibility and flexible manipulation of information at the onset can lead to tools that are built in open platform/open source environments. These innovations can then be adapted and improved over time to work with a number of devices and applications.

Simplify accessibility development and testing. Consider ways to make it easier for developers to incorporate accessibility. This will enable developers to more seamlessly build accessibility into social media and other user-friendly interfaces and plug-ins. Accessibility testing for conformance with Section 508 needs to be faster, simpler, and more effective. Tools that can test multiple pages and content for accessibility can help meet this goal.

Move toward innovations in personalization. The Federal government should stimulate the development of accessibility tools that are tailored to the needs of individuals. Users should have an ability to set their personalized settings within applications or on devices that will provide tailored access based on individual needs and preferences. A move toward personalization is not limited to people with disabilities. Rather, users with and without disabilities may prefer using speech-to-text rather than keyboarding. In addition to meeting the needs of users with sensory or physical needs, we need to begin to consider cognitive needs.

Establish enforceable accessibility standards. Federal investment can be a powerful influence for accessible innovations. The procurement process should promote standards with clear metrics that are considered at the beginning stages instead of the back end of development. With more clarity and specific metrics, developers will be able to understand and create tools to meet challenges

of accessibility. Likewise, grant and contract officers will have clearer standards to determine whether an application or product meets Section 508 standards.

Expand accessibility training that utilizes certification standards. Federal executives, managers, researchers, grants and contract officers, information and technology personnel, information officers and Section 508 coordinators have varying levels of awareness, knowledge, and skills about accessibility. Certification standards, examples of recommended practices, and training are needed to apply accessibility to all levels of federal activity.

Outcomes

Participants reported that hearing from a spectrum of speakers and formal respondents was beneficial, informative, and relevant to 508 programs. The presentations provided them with new information and insight to bring back to the workplace. Participants indicated their plans for future actions include increasing Section 508 awareness at their agency; setting up meetings with stakeholders; conducting research; incorporating information in agency planning and training; and encouraging standard processes for development and accessibility.

This summary of proceedings describes stakeholder perspectives regarding innovations, challenges, and recommendations presented during the meeting. This information will be the basis for further discussions to frame a research agenda.

Topic 1: Mobile Applications

Presentation: An Accessible Network of Everyday Things

T.V. Raman, PhD, *Research Scientist, Google, Inc.*

Dr. Raman's presentation discussed trends and opportunities for incorporating accessibility into mobile applications. Technology is evolving toward a world where everyday things are interconnected and mediated by technology. The computing industry has undeniably evolved, becoming increasingly miniaturized, modernized, and modularized. Today data is ubiquitous and the way users interact with digital information separates the message from the medium. Dr. Raman challenged participants to consider ways to ensure that this next generation of technology delivers on the promise of true universal access.

New and Emerging Technologies and Innovations

- **Speed of Innovation.** Pocket-sized smart phones today rival the personal desktop computers of yesterday. With the current pace of evolution, devices five years from now will be unrecognizable from the smart phone of today.
- **Accessibility is a key driver for many innovations.** This new world of technological innovation brings with it the promise of eliminating differences among humans by continuously bridging the gaps that result from variations in our individual needs and abilities — this technological flood promises to raise all boats.
- **Today data is ubiquitous.** Only 15 years ago, people had very limited access to the amount, type, and location of information they could access. Today, however, if a person has a smartphone, they have a network connection that enables them to access all kinds of information from any location.
- **Multiple interaction modalities.** Increasingly, users can interact with digital information in multiple interaction modalities. The way users interact with digital information separates the message from the medium. For example, users can utilize speech input and output, gesture-based interaction, touch interaction with haptic feedback to interact with information or data.

> *"Disability is the tip of the spear for innovation"*
> *- T.V. Raman*

Challenges

- **Nonscalable applications.** As the quantity of information rapidly expands, the field is beginning to consider information in terms of data one can interact with, consume, view, and manipulate. Many of the ways people address accessibility do not scale, that is, they cannot be built upon or used for other tools or applications. When accessibility is considered only after a tool is created, developers must go back to the basics and break down the applications to their building blocks in order to make it usable on a PC, the cloud, a smart phone, or tomorrow's device. However, many things do not scale because they weren't built to be compatible for other uses and other current and future devices. That is a problem especially as information technology moves so quickly and permeates our lives.
- **Rapid task completion.** Today, almost everyone in society has access to technology. So the metric of success that distinguishes one person from the next is his/her speed of task completion. The Assistive Technology (AT) industry, therefore, cannot just settle for equal access; it has to strive for superior access which demands faster access for speedier task completion.
- **Personalization.** Being able to access the information with the personalized access relevant for each user rather than an interface someone else wants is a more relevant challenge than universal access. If all the interfaces on a device are purely speech driven, somebody who is deaf or has speech impairment is going to be blocked out. If the interfaces are gesture-based, somebody with motion impairment is going to be blocked out. The key, therefore, is to leverage the device's multi-modal interaction capabilities.
- **Focus on presentation over content.** Agencies currently address access needs by creating accessible presentations. Agencies need to provide content. This shift would reduce the burden of accessibility on the agencies. The end user can then put the content into the presentation that works for them.

Recommendations

- **Enable access in more user contexts.** Bring technology within the reach of more users by enabling access in more user contexts. Leverage the device's multi-modal interaction capabilities (e.g. vision, speech, and gestures) without hardwiring them in as the only means of interaction. The federal government can improve reach, context, and speed.
- **Separate content from presentation and interaction**. Separating content from presentation will enable content reuse allowing information to be projected in a form that can be efficiently consumed by the user. Separating interaction from the presentation will enable multiple interactions. Separating application logic from user interaction will enable flexible access. By separating content from presentation and interaction, developers will be laying the groundwork for accessibility.

- **Use Application Programming Interface (API).** The Federal government should ask contractors and others to provide data in a very basic data-oriented API. User interfaces and complex wizardry should be structured around the API. As the industry evolves, the visual interface and other interfaces will become obsolete while the API will survive.
- **Make accessiblity present in everyday things.** More information content needs to be available online; accessible via multiple formats (e.g. speech, Braille, etc.); and available across different languages.

Response

Paul Schafer, *Information Technology Specialist and Assistant 508 Coordinator, U.S. Department of State*

As the field of technology has evolved accessibility has become complicated. We need to simplify accessibility to reach the largest possible audience. Developers must provide very basic data oriented APIs. Accessibility features should only need to be built into a product once. The questions become, "How do we go from our current stage into the stage where everything is multi-modal and personally automated to the user's needs?" and "What are the concrete steps that the federal government can take to move in that direction?"

Allen Hoffman, *Program Analyst, Veterans Health Administration, U.S. Department of Veteran Affairs (VA)*

Accessibility does not top the developer's to-do list. The industry has to make the whole process of making products accessible easier for developers. We need to define accessibility requirements clearly at the onset. This will help lower the barrier for making products accessible and in turn, promote accessibility. Also, in order for accessibility to take off, the barrier to doing accessibility work has to be lowered. For example, most of the information found on social media websites is posted by users who are not programmers. The industry has to figure out how to lower the accessibility barrier so that these users can start providing information that includes the accessibility attributes.

Topic 2: Accessible Collaboration Technology

Presentation: Optimistic and Realistic Paths to Accessible Collaboration Tools

Gregg Vanderheiden, PhD, *Director, Trace Research and Development Center*

Companies are increasingly using collaboration and telecollaboration to tie together distributed teams and to help reduce travel costs and wear and tear on key personnel. In the process, telecollaboration software and systems are becoming ingrained in both work teams and project management. People who cannot use or access these tools will be excluded from effective participation in many project teams. These tools rarely have accessible versions. Even when they exist they are useless if they are not the tools being used in the teleconference or the project. Dr. Vanderheiden shared strategies for making telecollaboration systems accessible as well as strategies for incorporation in or working with mainstream telecollaboration systems. He also discussed the need for strategies to allow individuals to access all of the different collaboration systems.

New and Emerging Technologies and Innovations

Collaboration and telecollaboration tools are reinventing the workplace and productive social interactions:

- **Captioning.** Captioning is becoming easier and less costly with speech recognition, repositional captioning, caption identification (displays captions with speaker's name), and RtF-CCC (Crowd-sourced caption correction in a rich text format).
- **Innovations for users with blindness.** At the push of a button, a user receives an audio description of what is happening action-wise (e.g., what the speaker is pointing to), and can control the speed so that no part of the presentation is missed. Another tool ensures that the slide on the screen reader is the same as the slide being presented.
- **Assistance on demand.** This tool allows the user to ask for help during a teleconference if he does not understand something. After listening to the provided description, it will start where the user dropped off and play the meeting just a little faster than real time until he is caught up. This enables the user to receive audio descriptions without missing any of the meeting's content.
- **Touch and Read.** If the user sees a word that he does not know, is unfamiliar with the language, and/or has trouble reading it, he can touch it and have it read aloud to him.
- **Touch and Explain.** Provides an explanation of an unfamiliar topic.
- **Preview/Screening Tool**. This tool will review the materials in advance and tells the user if there are words and/or concepts that may not be in the dictionary of things he knows.

- **Expressive Language Repair.** This tool will clean up user-generated text so that it contains the right tenses and words. For example, it will take the statement, "Hi, my name is Timmy. How are you," and transform it to "I am pleased to make your acquaintance, my name is Timothy."
- **Open Access Tool Tray System (OATTS).** OATTS is a modular and open source/open platform tool that is launched with a bookmark on a web browser and contains the free and commercial tools for users to interact with an application. It is being designed to work with cooperating and non-cooperating telecollaboration software.

Challenges

- **Inaccessible telecollaboration excludes some users.** Barriers to telecollaboration access include information presented in visual-only or auditory-only format. Presentation may be complex with language issues that are beyond the comprehension of users and it may be physically challenging to use controls.
- **Inaccessible collaboration tools.** Collaboration tools may not be of the user's choosing but of the host's choosing. So it is possible that the host will choose a telecollaboration tool that is accessible to some but not to everybody in the group. Also the accessibility tool offered may not work with the telecollaboration tool used.
- **Solutions can pose new barriers.** If there is an audio description and captioning at the same time, it is difficult to listen to two things at once. Also, captioning may get in the way of needed visual information on a presentation. A captioning tool might cover up a chat box in a teleconference, causing the user to miss information.

> *"We need an infrastructure to make it easier to discover what kinds of solutions would work for individuals…to apply anywhere on any device or software"*
> - Gregg Vanderheiden

- **Incompatible infrastructures.** It is too expensive to keep creating access from scratch, so there needs to be an infrastructure that simplifies user access and operates on any device or software.

Recommendations

- **Support research and development activities.** Continue to support research and development activities that may lead to new strategies for making telecollaboration systems accessible as well as approaches for incorporation in or working with mainstream telecollaboration systems. The goal is to conduct research that will help to transform the user interface so that it fits the specific needs and abilities of the user on any device.
- **Involve users in development and testing.** Technology alone is not the solution, there need to be studies involving users interacting with technology. Collaboration with users could produce better products focussed on what is needed.
- **Increase Federal support for research.** Challenges that research can answer include:
    - Effects of delays and different forms of interaction;
    - More automatic, less costly and quicker ways to transform data;
    - Audio descriptions for real-time presentations;
    - User needs beyond the identified tools ;
    - Technology, such as an info-bot that can go through legacy websites and data and be able to make them reasonably usable to readers using current technology;
    - Mechanisms for handling whiteboard interactions;
    - Commercially hardened implementations of all of the identified telecollaboration concepts;
    - Self-adapting interfaces (based on user needs and preference sets); and
    - Individual User Interface (IUI) Generators.

Response

Norman Robinson, *Acting Deputy Executive Director, Office of Accessible Systems & Technology, Department of Homeland Security (DHS)*

The government should be more specific in informing developers about requirements. For instance, content needs to be in a data format. If there is video there always needs to be a captioning track, or possibly audio description. If technology is open source, we could also direct developers to open source tools that will make their product accessible. If the government required it, brilliant developers would understand it and create wonderful things for people that work for everybody. Accessibility needs to be automatic and built into the tools we are using so that content can be more freely developed and shared. Government procurement creates a pull in the market, so the government can encourage solutions. By breaking up the problem into smaller pieces that are a part of the whole, more people will be able to tackle the problem until there is a solution.

Topic 3: Assessment Approaches for Accessible Technology

Presentation: Improving Web Accessibility Through Improving Interactive Practices

Cyndi Rowland, PhD, *Executive Director, WebAIM; Associate Director, Center for Persons with Disabilities, Utah's University Center of Excellence in Developmental Disabilities, National Center on Disability and Access to Education*

Organizations that want their web content and applications to conform to Section 508 must ensure success in a tripartite model, "to develop, procure, and maintain" an accessible web so that it adheres to Section 508 standards. This is a complicated process, one that interacts across several categories of success. Rowland shared innovations, described gaps in knowledge and practice, and identified potential topics for research in three areas: evaluation metrics; human capital and capacity building; and an evaluation of the organizational system that supports web accessibility initiatives and outcomes.

New and Emerging Technologies and Innovations

- **Web Accessibility Evaluation Tool (WAVE).** This is a free web accessibility evaluation tool that renders and evaluates content presented within a cascading style sheet (CSS), providing a truer representation of the end user experience. From this feedback, developers can learn what they need to do and not do to make web content more accessible. The tool can be found at: Web Accessibility Evaluation Tool (WAVE): http://wave.webaim.org/.
- **Gaining Online Accessible Learning through Self-Study (GOALS) and Benchmarking Planning Tool.** This is a benchmarking and planning tool for higher education from the National Center for Disability and Access to Education (NCDAE). The tool can be found at: National Center for Disability and Access to Education (NCDAE) http://ncdae.org. There are four indicators of institutional accessibility, each of which has a series of benchmarks:
    - Leadership commitment and support
    - Policy and implementation planning
    - Resources and supports
    - Assessment

Challenges

- **The Voluntary Product Accessibility Template (VPAT)** process does not always lead to good outcomes. Current tools differ in how they present the information, the types of things they check, and their capabilities to spider through content to other pages. Even if content has been checked through automation, detecting accessibility issues does not necessarily make it more useful and human judgment is necessary.
- **Inconsistent web accessibility testing.** ***The Section 508 Report to the President and Congress: Accessibility of Federal Electronic and Information Technology***, issued by the Department of Justice in 2012, found that 58% of Federal agencies routinely test web pages, forms, and applications using automated and/or manual processes. Of this group, 24% use only manual checks and 6% use only automated processes. The report recommended that agencies use both automated and manual testing, with manual testing based on a consistent test process relying primarily on code inspection.

> *"We are now at a place where everyone needs to take ownership of accessibility outcomes. It is no longer the technical people or the geeks."*
> - Cyndi Rowland

- **Certification standards.** There are no systems for certifying that personnel have the skill to ensure products and content are accessible. So there is no way to assess the level of personnel knowledge and skill. There is no mechanism to verify whether web creators, developers, and office staff - all those responsible for developing, procuring and maintaining accessible goods and services – have the necessary knowledge and training.
- **Lax accessibility enforcement.** Federal procurement guidelines allow discretionary grantees to create inaccessible products. Procurement personnel do not have the knowledge and skills to ensure that contractors will produce an accessible product.
- **Lack of User Input and Influence.** We need more systematic information about user experience and needs and more users with different technology needs who can test for accessibility and influence practice.
- **Limited information about cognitive web accessibility.** Users with cognitive and learning disabilities represent the largest number of individuals with disabilities. The accessibility approach can't be the same as for those with sensory and motor disabilities. We don't have enough information about cognitive issues.
- **There is a need for improved supports**. Accessible Rich Internet Applications (ARIA) does not have final specifications and there is no support for HTML 2.0.

Recommendations

- **Improve evaluation metrics**. Metrics used to determine web accessibility including the page as it is rendered to the user, automated path analysis, and the cognitive load of text

need to be developed. Standardize the use of accessibility evaluation and indicators of accessibility success across sectors.

- **Educate and support the wide array of personnel in accessibility**. The industry has to determine how to best educate and support the next generation of content developers to ensure that they have the necessary and demonstrable knowledge and skills.
- **Incorporate user experience**. Improve the science of incorporating user experience to inform industry and accessibility personnel.
- **Improve cognitive accessibility**. Add accessibility for people with cognitive disabilities to the research agenda.

Response

Holly A. Anderson, Policy Liaison for Individuals with Disabilities, Office of Postsecondary Education, U.S. Department of Education (ED)

Agencies have to increase awareness about accessibility information, and having executive support is a crucial element when it comes to increasing awareness. In an effort to increase awareness, ED is mandating that all of their grantees produce accessible documents. ED is also looking into the reasons why computer science departments at universities and colleges are not teaching about accessibility. Accessibility requirements are often buried in the procurement process and only checked during the production readiness review. In order to produce good, accessible outcomes, the government has to start at the beginning with grants and contract awards. There needs to be specific language in requiring people receiving discretionary grants to produce accessible documents.
In most cases, the accessibility process is not being started at the beginning of production, but rather at the end. While Section 508 experts know that websites have to be Section 508 compliant, most project managers do not really understand what that means. Usually someone has to visit the 508 coordinator at the end of the production readiness review to check whether their product meets 508 standards. It is the preferred process to incorporate the compliance process at the beginning of production.

Industry Perspective - Opportunities for Research and Partnership

Industry Respondent: Brian Cragun, IBM Corporation

IBM is beginning to understand that creating accessible tools is important, not just because of litigation or for noble reasons, but because there is a demand in the marketplace. IBM customers also see accessibility as a segment in the marketplace and they want to reach all the customers they can. Accessible tools have become an important focus for IBM's investment and research. Accessible tools should consider a broader need to address situational disabilities, such as an executive driving a car who would like to respond to a text, the aging population, and people with low literacy. If you solve a problem for a person with a disability, you are solving it for a broader audience.

Knowledge Gaps

- **User involvement in testing.** Manual user testing is needed in order to create tools that can be accessible for varied user needs across a variety of platforms.

> *"If you asked me what keeps me up at night, it has shifted from getting my own products to be accessible…to the concerns of my customers who are creating products using our tools and they want to be able to create accessible products."*
> - Brian Cragun

- **Inflexible development of tools.** Developers need to consider, not only the native application, but also hybrid applications and future applications.
- **Unclear standards.** Standards and legislation have to be clearly defined so that industries can explain them to the developers. Standards also can help developers who are building tools for overseas markets where users speak different languages.
- **Training.** There is a lack of proper training for developers. IBM is trying to get accessibility training incorporated into their boot camps to address this issue.
- **Trade-offs between security and accessiblity.** It is difficult to balance security needs with accessibility needs. Making security more compatible with accessibility is another are of investigation at IBM.

Recommendations

- **Test all applications.** Do not assume that an application that works well on a PC internet browser will also be accessible through the browsers on a mobile device.
- **Develop standards for current and future technologies.** Be prepared to have the same standards apply both to the old technologies as well as to the new technologies that are emerging.
- **Build a business case for accessibility.** In order to make accessibility a part of an organization's operational framework, accessibility awareness needs to start from the top down. An approach might be to help executives understand how tools developed for accessibility are relevant and marketable to a broader user base that includes people who are aging, have low literacy, who speak languages other than English, or who enjoy the flexibility and convenience of using an application such as speech-to-text.

Industry Respondent: Susan Mazrui, AT&T Services, Inc.

We need to understand how to make user interface more consistent and usable. The basic challenge is that there is no strategic approach to developing standards or guidelines. As a result, developers are unclear about how to create tools that can operationalize what it means to be accessible. This is solvable problem that could be better addressed through an inclusive infrastructure that fosters collaboration between users, industry, and the government.

Knowledge Gaps

- **Systematic approach to developing guidelines.** There is no systematic approach to defining what "accessible" and "usable" means. Developers have been awaiting government guidelines for quite a while. Having certainty would help developers.
- **Limited ways for users and industry to be a part of the solution.** Users with disabilities and the industry know about solutions and can find information for people in government who don't have a disability and who are not as knowledgeable. There is no strategic method for dealing with problems pertaining to accessibility (e.g., when a consumer finds an accessibility barrier).
- **Incompatible devices and tools.** An accessibility tool that works well, may be blocked out when the device's operating system doesn't allow that tool to work in parallel with the device.
- **Insufficient funding.** There is insufficient funding to support training for accessibility-related development, testing, or metrics.

Recommendations

- **Enforce accessibility requirements**. The government should require contractors to provide information in accessible formats. Then it should monitor compliance. There is no accountability if people are not paying attention.
- **Support more accessibility training**. Provide government funding for training, development, testing, and metrics.
- **Include users with disabilities**. Utilize users with disabilities and the industry to establish a collaborative, inclusive infrastructure for developing accessibility solutions. If there is a problem, the government and the industry should work together with consumers with disabilities to develop a resolution, and they should make sure that the resolution is widely adopted. Invest in making accessible software development kits so that people with disabilities can participate.
- **Make the user interface more consistent and usable**. Create tools that do not require developers to learn 50 different things. By default, they should be able to develop accessible content.
- **Improve online accessibility**. A priority is to make online meetings, presentations, and interactions more accessible.

> *"Put the solutions in place before they become a problem."*
>
> - Susan Mazrui

Stakeholder Input

Throughout the day, participants voiced a number of questions and comments as they identified examples of success, additional issues, and knowledge gaps and offered recommendations for research and policy.

Examples of Success

Co-moderator Matt Quinn recognized a number of stakeholders at the forum who have taken the personal initiative to be transformative national leaders inside the ranks.

- Federal employees are beginning to dialogue and share best practices in Section 508 with their colleagues. The ICDR is creating a forum to bring people together to meet and dialogue about research issues and solutions.
- At the Federal Communications Commission (FCC), executives tag along with a person with a disability for a day to gain a better perspective about disabilities.
- People in leadership positions, like Bill Peterson at DHS, have been active in ensuring that Section 508 and accessibility are important considerations.
- People with disabilities have been innovators and accelerators of innovation. Lack of accessibility is an impediment to innovation.

Participants cited examples of Federal/industry collaboration. These include:

- Bridge Media worked with the Access Board, the National Science Foundation, the Office of Special Education Programs, and the FCC on video description. At this point, 20 children's television shows on CBS and NBC provide video description.
- The Centers for Medicare & Medicaid Services (CMS) has been working with Adobe to make the next version of Adobe Connect 9 more accessible.

Areas for Improvement

Training needed.

- Accessibility and usability standards are not a part of the training curriculum in higher education for designers and developers. There is a huge knowledge gap between development and usability education. This is an important issue because tools do not write code, humans do. To help close this knowledge gap, people have to learn about usability and accessibility early on. Since the next generation of users is learning how to use different gadgets at a very young age, perhaps we can start incorporating usability and accessibility training into the grade school curriculum.

Clear standards and use cases.

- There are no standards for accessibility. Technology is developing rapidly and people want to use new tools, yet are being told they can't because of Section 508 compliance issues. The people responsible for Section 508 compliance can't give answers about whether something is Section 508 compliant because they do not have the tools.
- Accessibility needs to be built into the procurement process. Use cases for accessibility can be built into the acquisition process.
- There are no consequences if agencies are not in compliance. The undue burden section of the law allows agencies to waive the 508 requirement.

User involvement in development and testing.

- There should be a feedback mechanism for people with accessibility issues, especially customers, who can't interface so they give up at the point of entry.
- Since current web analytic tools have varying degrees of success, it may be time for crowd-based evaluation. It would be great if people with disabilities could give their opinions of federal sites.

Future technological development needs.

- Web page functions might work in one browser, but not another. As user agents are able to personalize information, it is not certain which browsers will support those user agents.
- Current web analytic tools are only capable of analyzing one page at a time.

Build awareness and support for accessibility.

- In order to improve communication and inform people about what the government and industry are doing in terms of accessibility, the idea of "Fed Talks" was raised. During these talks, they can explain the standards of accessibility, discuss where the government and industry are and where they are headed, and give grantees the chance to share what they have learned.
- A lot of the new scripting is very difficult to use. Perhaps if the industry couched accessibility in broader terms, management officials will be more inclined to provide greater financial support to make products more accessible.
- The industry should find and publicize stories that demonstrate people with disabilities using technology in innovative ways. This will help change the culture by helping developers and the heads of agencies realize that accessibility is not an impediment to innovation, but a link to progress.
- Better access to information about tools to automate, or at least partially automate making HTML accessible, including simple and complex data tables, accessible mathematical charts or equations is needed.

Stakeholder Working Groups

In the final activity, participants split into work groups to discuss knowledge gaps and possible solutions. Once they had brainstormed gaps, the participants used a modified nominal group process to prioritize the group's top knowledge gaps.

Group 1: Accessible Mobile Technology

Co-Facilitators:

- **Paul Schafer**, Information Technology Specialist and Assistant 508 Coordinator, U.S. Department of State
- **Allen Hoffman**, Program Analyst, Veterans Health Administration, VA

Top Knowledge Gaps:

- Expand user involvement at the innovation stage to include individuals with disabilities to stimulate creative ways to incorporate accessibility into the next technologies.
- Develop better ways to test accessibility on mobile devices.
- Define standards and protocols for open exchange (e.g., communication between devices, computers, washing machines).
- Build in the capability to develop a tool once and deploy it across multiple platforms.

Group 2: Accessible Collaboration Technology

Co-Facilitators:

- **Norman Robinson,** Acting Deputy Executive Director, Office of Accessible Systems & Technology, DHS
- **David Baquis,** Accessibility Specialist, U.S. Access Board

Top Knowledge Gaps:

- Develop user tools to convert existing web pages with inaccessible content such as charts, tables, diagrams, and pictures, into accessible formats.
- Develop authoring tools with built in accessibility tools for information and graphics.
- Develop tools to auto-personalize information so that the user receives accommodations for his specific needs and preferences.

Group 3: Assessment Approaches for Accessible Technology

Co-Facilitators:

- **Holly A. Anderson,** Policy Liaison for Individuals with Disabilities, Office of Postsecondary Education, ED

- **Don Barrett**, Section 508 Coordinator, ED

Top Knowledge Gaps:

- Establish a certification in accessibility development and testing.
- Develop a strategic implementation plan to increase the accessibility of federal data and information.
- Conduct an assessment of existing automated accessibility tools for all electronic interface technologies (EIT), not just the web.

Appendix: Speaker Bios

T.V. Raman, PhD
Research Scientist
Google, Inc.
Email: raman@google.com
Dr. Raman's Website

Dr. T.V. Raman is a Research Scientist at Google, leading accessibility for Google, Google Android, and Google Chrome. He focuses on high-quality eyes-free interaction and auditory users interfaces. He presently focuses on driving the mobile and web platforms forward via Android and Chrome. A graduate of Cornell, Dr. Raman has over 17 years of leadership experience in advanced technology development. During this time, he has authored three books and received over 50 patents; his work on auditory interfaces has been profiled in mainstream publications including the *New York Times* and *Scientific American*. He has been a leader in defining numerous W3C standards including XForms and Aural CSS. Dr. Raman's work and daily challenge to himself is to deliver technologies that enable ubiquitous, eyes-free access to the emerging web platform from a wide variety of devices ranging from smart phones and tablets to network-based computers. Speech is the next dimension in user interfaces, and he is developing application frameworks that combine speech technologies with the power of the web Cloud to deliver innovative solutions that enable anytime, anywhere access.

Gregg Vanderheiden, PhD
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Professional Industrial & Systems Engineering and
Biomedical Engineering University of Wisconsin-Madison
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Dr. Vanderheiden's Website

Gregg Vanderheiden is Director of the Trace R&D Center and a professor in both the Industrial & Systems Engineering and Biomedical Engineering Departments at University of Wisconsin-Madison. Dr. Vanderheiden has been working on technology and disability for over 40 years. He was a pioneer in the field of Augmentative Communication (a term taken from his writings in the 1970's) before moving to computer access in the 1980s. Many of the accessibility features that are now built into every Macintosh, Windows, and Linux computer were created by his group in the 1980s. He has worked with over 50 companies, served on numerous governmental advisory and study committees on both sides of the ocean, and has chaired and/or edited many of the early accessibility standards.

He is co-founder of Raising the Floor: http://raisingthefloor.net and initiated the international efforts to build the Global Public Inclusive Infrastructures (GPII): http://GPII.org.

Cyndi Rowland, PhD
Executive Director, WebAIM
Associate Director, Center for Persons with Disabilities
Utah's University Center of Excellence in Developmental Disabilities
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Dr. Rowland's Website

Cyndi Rowland is the Associate Director at the Center for Persons Disabilities (CPD) at Utah State University. The CPD is part of a national network of University Centers of Excellence in Disability Research, Service, and Education. The focus of Cyndi's work and expertise is accessible information communication technology (ICT). She is the founder and Executive Director of WebAIM since 1998. WebAIM provides web development professionals with knowledge, skills, organizational strategies, and vision to assist in making web content accessible. For the past 11 years she has been the Technology Director for the National Center on Disability and Access to Education (NCDAE). This Center works to advance the accessibility of online educational content through their work on policy and standards, resources, tools, and an emphasis on organizational strategies. Dr. Rowland has engaged in research, tool development, education, policy, and standards at national and international levels. She currently directs the Gaining Online Accessible Learning through Self-Study (GOALS) project to help postsecondary institutions in their decision to commit to web accessibility enterprise-wide; and StartSmart K-3 Plus, a longitudinal research project to identify the effects of New Mexico's K-3 Plus project on students' academic and social outcomes.

Brian Cragun
IBM Master Inventor
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Brian Cragun is a Senior Accessibility Consultant with IBM's Human Ability and Accessibility Center. He has a broad background in Graphical User Interface development, and specializes in accessibility, including mobile devices, complex visualizations, and Agile processes. He is an IBM Research Master Inventor with over 130 filed and 80 issued patents. His received he undergraduate degree in Computer Science from Utah State University in 1982 and his Masters in Manufacturing Systems Engineering from University of Wisconsin – Madison in 1986. His other interests include Human Computer Interaction, speech recognition and synthesis, intelligent agents, intellectual property, multimedia, and records indexing. He and his wife have five children, and his hobbies include genealogy and oil painting as an artist.

Susan P. Mazrui
Director, Global Public Policy
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Susan P. Mazrui began work at Pacific Bell in 1994 where she gained experience in marketing, external, and regulatory affairs. In 1998, she moved to the wireless field where she developed corporate strategies for state and federal compliance-related activities. Over the last fifteen years, Ms. Mazrui presented at numerous conferences including Telecommunications for the Deaf, Inc. and the National Association of Consumer Agency Administrators and has written articles in consumer publications including Critical Issues in Aging and AccessWorld®. Ms. Mazrui served two terms on the Federal Communications Commission's Consumer Advisory Committee, as well as terms on the national advisory committees of the Telecommunications Rehabilitation Engineering Research Center and the Information Technology Technical Assistance and Training Center (ITTATC). Ms. Mazrui currently works on disability-related public policy issues and serves as the liaison with national disability organizations for AT&T. She works on a variety of accessibility efforts at AT&T and serves on the Expert Team on Access and Aging. She currently serves on the Board of Directors for the U.S. Business Leadership Network and on the Board of Trustees for the American Foundation for the Blind. Ms. Mazrui was the 2002 Summit on Leading Diversity Corporate Fellow, inducted into the Spinal Cord Injury Hall of Fame in 2008 and recognized by Careers and the Disabled as Disabled Employee of the Year in 2013.

Point of Contact

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