Preliminary Regulatory Impact Analysis

Proposed Update of Section 508 Standards and Section 255 Guidelines

Contract No.:
GS-10F-0269K

Order No.:
DTOS59-09-F-10094

Project No.:
1030-001

Submitted To:

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February 12, 2015

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Executive Summary

The U.S. Architectural and Transportation Barriers Compliance Board (hereafter the "Access Board") is the Federal agency that promotes equality for people with disabilities through leadership in accessible design and the development of accessibility guidelines and standards for the built environment, transportation, communication, medical diagnostic equipment, and information technology. Section 508 of the 1973 Rehabilitation Act, as amended in 1998, is intended to ensure that people with various types of disabilities have equal access to information and communications technology (ICT). In 2000, the Access Board developed and adopted standards to support the implementation of Section 508. The current Section 508 standards contain six sections of requirements that apply to Web sites and applications, software applications and operating systems, telecommunications products, video and multimedia products, "self-contained, closed products" (such as multifunction copiers), and desktop and portable computers. The current standards also apply to electronic content, including documents, audio, video, and multimedia. Section 508 is specifically applicable to Federal Government agencies, but the standards are also relevant for Government contractors and vendors of ICT products, services, and content.[1]

Section 255 of the Telecommunications Act of 1996 sets forth accessibility guidelines that apply to telecommunications equipment manufacturers. The Access Board published guidelines in 1998 to implement Section 255, which requires manufacturers to ensure that a wide range of telecommunications equipment and customer premises equipment (CPE) be made accessible when provision of such access is "readily achievable."

Access Board Proposal

The Access Board is proposing to update the existing Section 508 standards and Section 255 guidelines. One of the key proposals in the Notice of Proposed Rulemaking (NPRM) is to use the most recent version of the Web Content Accessibility Guidelines (WCAG 2.0)[2] and other consensus standards for specific applications, content, and equipment to define the core set of accessibility requirements not only for Federal agency Web sites, but also for non-Web software applications and authoring tools, data processing and communications hardware, telecommunications equipment, and electronic content procured, developed, maintained, or used by the Federal Government. The NPRM would specifically require ICT and specified forms of electronic content produced using these programs and systems to meet the Level A and Level AA Success Criteria and Conformance Requirements specified for Web pages in WCAG 2.0.

[1] The term "information and communication technology" is used throughout the NPRM preamble and proposed rule to broadly encompass electronic and information technology covered by Section 508, as well as telecommunications products, interconnected Voice over Internet Protocol (VoIP) products, and CPE covered by Section 255. Examples of ICT include computers, information kiosks and transaction machines, telecommunications equipment, multifunction office machines, software, Web sites, and electronic documents.

[2] WCAG 2.0 is a comprehensive set of consensus standards developed by the World Wide Web Consortium (W3C). WCAG 2.0 specifically addresses the accessibility of Web sites. However, the WCAG 2.0 standards are written to be technology neutral, with requirements specified in terms of access to functionality rather than programming languages (such as HTML or JavaScript).

In addition, the Access Board is proposing to require telecommunications equipment and CPE to support real-time text (RTT) communications capabilities and protocols.[3] Other consensus standards for digital television tuners, software user interfaces, electronic documents in Portable Document Format (PDF), and other aspects of ICT performance would also be incorporated by reference. Federally procured IT hardware and telecommunications equipment would also be required to comply with some elements of the current accessibility standards for automatic teller machines and self-service fare machines, which are set forth in Section 707 of the 2010 U.S. Department of Justice (DOJ) Standards for Accessible Design.[4] A summary comparison of the proposed provisions with the current Section 508 standards and Section 255 guidelines is provided in Appendix A.

The Access Board proposal would also require telecommunications equipment manufacturers to meet the relevant WCAG 2.0 and 2010 Americans with Disabilities Act (ADA) standards when compliance is readily achievable. The proposed Section 255 guidelines would apply to all covered types of telecommunications equipment (e.g., cellular and wireline phones, fax machines) sold in the U.S. market.

Summary of Benefits and Costs of the Proposed Rule

The primary focus of this preliminary regulatory impact analysis (RIA) was to define and, where possible, quantify and monetize the potential societal benefits and costs of the proposed Section 508 standards and Section 255 guidelines. Benefits were evaluated for Federal employees and other people with various types of vision, hearing, and speech disabilities and those with manipulation, reach, or strength limitations (collectively referred to in this evaluation as "addressable disabilities"). Benefits to Federal agencies and to ICT manufacturers and developers were also examined. We tried to identify, to the extent possible, which areas of the proposed requirements would result in specific categories of benefits for people with various types of disabilities. For a variety of reasons, however, it is not possible in most cases to quantify specific benefits of certain proposed requirements on people with particular types or combinations of disabilities. For example, quantifying the impact of the proposed requirements to improve the accessibility of Web site and software error notification and handling provisions would require information on the frequency of errors made by users over a representative set of software applications. It is unlikely that such information exists in usable form.

In addition, some of the most significant expected benefits from the proposed 508 standards and 255 guidelines are not evaluated, either because they could not be quantified (due to lack of data) or are inherently qualitative. For persons with disabilities, for example, accessible ICT would increase the range of tasks that a Federal employee or person with a disability can complete independently, and RTT allows persons with hearing loss to communicate in an interactive fashion more akin to typical spoken conversations. More generally, enhanced ICT accessibility for persons with disabilities can be expected to improve civic engagement, decrease stigma,

[3] RTT is a next-generation technology that is expected to supplant the already declining usage of older technologies that enable people who are deaf or hard of hearing to use standard telecommunications equipment. RTT displays text on RTT-compatible devices as it is being typed, rather than requiring the receiving party to wait for the entire message to be completed and sent.

[4] DOJ, 2010 Standards for Accessible Design, September 15, 2010.

promote equality, and enhance integration into American society. For manufacturers and developers of ICT products, harmonizing the 508 standards and 255 guidelines with consensus standards—particularly WCAG 2.0—would also be likely to assist U.S. ICT companies by helping to ensure return on investments in accessibility technology, remain competitive in the global marketplace, and achieve economies of scale created by wider use of nationally and internationally recognized technical standards. The fact that these benefits could not be formally assessed in this RIA does not diminish their importance or value.

Compliance costs were evaluated, and where possible quantified and monetized, for Federal agencies, Federal contractors and vendors, and U.S. and foreign telecommunications equipment manufacturers whose products are sold in the U.S. market.[5] Agencies and firms will incur costs to review and implement the proposed requirements; train employees; develop, produce, and test compliant ICT; and prepare and repair electronic documents and other types of electronic content. Contractors and vendors will also incur these types of costs to produce compliant ICT purchased by Federal agency clients. In many cases, the costs incurred will depend on the state of agency, contractor, or vendor compliance with both the existing and proposed Section 508 standards. For example, our interviews with agency representatives indicated that agencies differ in their compliance strategies and practices and that in certain areas, the degree of accessibility provided exceeds what is required by the existing standards (e.g., both software development and document creation accessibility is already being defined using many of the WCAG 2.0 standards in some agencies).

Many types of costs could not be quantified and monetized, however. In many cases, we were not able to locate adequate information regarding the costs associated with specific changes in software coding, hardware components, or communications protocols. There are also several ongoing Federal Government ICT initiatives that could reduce compliance costs, including the efforts to develop performance metrics to monitor the effectiveness and efficiency of Section 508 implementation at an agency level.

The impact on computer and telecommunications equipment manufacturers from the proposed rule is particularly difficult to quantify. Information on the impact of the proposed accessibility requirements was solicited in both the 2010 and 2011 Advance Notice of Proposed Rulemaking (ANPRM) and is again in the NPRM and this RIA. Absent this information, it is reasonable to expect that the costs incurred by U.S. and foreign ICT manufacturers to produce compliant products for sale in the U.S. market would be lower than the aggregate Section 508 compliance costs estimated for Federal agencies, contractors, and vendors.

As discussed below, some of the costs incurred by ICT manufacturers and developers could be embedded in the prices charged to all consumers, rather than being recovered solely through increased costs to Federal agencies for procured ICT. The RIA concludes that any such cost increase would be negligible—not more than 0.2 percent under the assumed upper bound of annualized compliance costs for computer and telecommunications equipment manufacturers.

[5] The current and proposed Section 255 guidelines would not apply to equipment sold by U.S. and foreign telecommunications manufacturers in markets other than the United States.

The Access Board invites the public to provide information, data, and methodologies for improving this assessment's estimates of the proposed rule's benefits and costs.

Table ES-1 summarizes the estimates of monetized benefits and costs developed for the proposed Section 508 standards and Section 255 guidelines. All benefits and costs were estimated for a 10-year time horizon and converted to annualized values using discount rates of 7 and 3 percent.

Table ES-1: Annualized Value of Monetized Benefits and Costs, 2015–2024 (Millions of 2015 Dollars)

Monetized Benefits and Costs	7-Percent Discount Rate	3-Percent Discount Rate
Benefits from increased Federal employee productivity	$46.6	$45.3
Benefits from improved Federal Government Web site accessibility to people with vision disabilities	$2.4	$2.3
Benefits to Federal agencies from reduced call volumes	$20.1	$19.8
Annualized value of monetized benefits	**$69.1**	**$67.5***
In-house ICT costs	$80.6	$76.3
Procured ICT costs	$74.4	$70.5
Costs of telecommunications manufacturer product support Web site and content development	$10.6	$9.8
Annualized value of monetized costs	**$165.6**	**$156.6**

*Benefit numbers do not sum to total because of rounding.

Benefits of the Proposed Rule

This preliminary RIA includes monetized estimates for three types of benefits that can be expected from adopting the proposed Section 508 requirements. These benefits have an equivalent annualized value of $69.1 million over the 10-year analysis period using a 7-percent discount rate (see Table ES-1 above).

As noted above, several categories of benefits that could be expected from the proposed rule could not be quantified. These benefits are listed in Table ES-2.

Table ES-2: Unquantified Benefits of the Proposed Rule

Time savings by people with hearing, cognitive, speech, or manual dexterity or motor impairments from more accessible Federal Government Web sites.
Improved accessibility of electronic content (especially PDFs and videos) on Federal Web sites for persons with addressable disabilities.
Potential increase in employment of people with addressable disabilities.
Increased ability for people with addressable disabilities to obtain information and conduct transactions electronically.
Better civic engagement by persons with disabilities due to improved access to information and services on Federal Government Web sites.
Greater independence for persons with disabilities who can potentially access information on Federal Government Web sites themselves, rather than having to rely on others to access such information for them.
Increased ability for people without disabilities to access information and conduct businesses electronically even when they are limited by their situation, such as in a noisy or low-bandwidth environment or bright outdoors.
Agency cost savings from reduced levels of mail correspondence and in-person visits.
People who are deaf or hard of hearing to have faster and more natural conversations with RTT than is possible with current text-messaging functionality.
Improved ability of individuals with vision impairments and other disabilities to evaluate, purchase, and make full use of telecommunications products with the accessibility features they require or prefer to use because of increased accessibility of product documentation and support services.
Federal Government access to a larger pool of developers and content creators with required accessibility knowledge and skills because of harmonized standards.
Benefits to State and local governments, businesses, and nonprofit entities from harmonization of standards, including potential cost reductions to ICT manufacturers from being able to sell a single line of accessible products and services in public-sector, commercial, and international markets.
Intrinsic (existence) value that people with and without disabilities derive from the nondiscrimination and equity values served by Sections 508 and 255.

Current (Baseline) Section 508 and Section 255 Costs

Limited data are available on the costs incurred by Federal agencies, contractors, and vendors to develop and maintain the current degree of required accessibility for various forms of ICT. Baseline estimates of current Section 508 compliance costs in five areas were developed for this evaluation. Overall baseline costs for in-house and procured ICT are estimated at $2.0 billion annually. This amount represents about 2 percent of annual Federal ICT spending, which is in the range between $80 billion and $120 billion, depending on which products and services are included in the total. Baseline costs for telecommunications equipment manufacturers to conform to the current Section 255 guidelines relating to product documentation and user support are estimated to be $114 million annually. Better estimates or information on current Section 508 and Section 255 compliance costs are specifically requested from the public.

Costs of the Proposed Rule

Econometrica developed estimates for five areas in which Federal agency, contractor, and vendor compliance costs are expected to increase under the proposed Section 508 standards:

- Policy development and implementation.
- Employee training.
- Software, Web, and audiovisual development.
- Software, Web sites, and audiovisual media evaluation.
- Electronic documents creation and repair.

Costs for manufacturers to comply with the proposed Section 255 guidelines relating to providing accessible electronic support documentation and services are also estimated. Collectively, the proposed revisions to Section 508 and Section 255 have estimated compliance costs of $165.6 million on an annualized basis over the 10-year analysis period using a 7-percent discount rate (see Table ES-1).

There are also several categories of costs that would result from adoption of the proposed rule but could not be quantified. These costs are listed in Table ES-3.

Table ES-3: Unquantified Costs of the Proposed Rule

Possible increase in Federal Government expenditures to provide accommodations if more people with addressable disabilities are hired.
Possible decrease in the amount or variety of electronic content produced to reduce Section 508 compliance costs.
Costs to develop and produce hardware and telecommunications products that comply with proposed standards.
Costs associated with implementing and supporting RTT on telecommunications devices with text display capabilities.

Better estimates or information on the projected increase in compliance costs under the proposed Section 508 standards and Section 255 guidelines are specifically requested from the public.

Overall, we expect the proposed revisions to the Section 508 standards to have a significant aggregate impact on compliance costs initially but cause only a small percentage increase in recurring annual costs, relative to current baseline costs. We expect that compliance rates would increase because the WCAG 2.0 standards provide a more detailed template for ensuring accessibility and because adopting these standards would facilitate the use of non-Section 508-specific training and support resources to enable Federal employees to produce and evaluate ICT products, software, services, and content.

As noted above, the impact on telecommunications manufacturers and purchasers of telecommunications products from the proposed revisions to the Section 255 guidelines is more difficult to quantify. It is possible that manufacturers of computer hardware and telecommunications equipment may elect to spread the costs of compliance with the proposed ICT standards and guidelines across all of their entire product lines. The potential impact on consumer prices can be assessed by assuming that these manufacturers would incur compliance

costs equal to the entire amount estimated in this analysis for Federal agencies, contractors, and vendors (about $155 million on an annualized basis) with the aggregate value of annual shipments in this sector (about $100 billion). Under this conservative assumption, the incremental compliance costs incurred by computer and telecommunications equipment manufacturers would be still less than 0.2 percent of the value of their annual shipments.

Conclusion

This preliminary evaluation indicates that the monetized costs of the proposed rule exceed the monetized benefits. The annualized costs for the proposed Section 508 standards, net of the annualized benefits, represent about 4.5 percent of current annual Section 508 compliance costs. It is important to note, however, that there are potentially substantial compliance costs as well as significant benefits to people with disabilities, Federal agencies, contractors, and vendors for which adequate data were not available to develop monetized estimates. Indeed, the benefits of the proposed rule include important but inherently unquantifiable national values that are explicitly recognized in Executive Order 13563, including greater social equity, human dignity, and fairness.

Considering all monetized and qualitative benefits and costs together, the Access Board and Econometrica have made a preliminary determination that the benefits of the proposed update of the Section 508 standards and Section 255 guidelines justify the costs.

1. Introduction: Proposed Update of the Section 508 Standards and the Section 255 Guidelines

The Access Board is an independent Federal agency devoted to accessibility for people with disabilities. The Access Board develops and maintains design criteria for the built environment, transit vehicles, telecommunications equipment, and electronic and information technologies.

Section 508 of the Rehabilitation Act (as amended) requires that when Federal agencies develop, procure, maintain, or use electronic and information technologies, they must ensure that the electronic and information technologies allow Federal employees with disabilities to have access to and use of information and data that is comparable to the access to and use of information and data by Federal employees who do not have disabilities, unless doing so would impose an undue burden on the agency. Section 508 also requires that members of the public with disabilities who are seeking information or services from a Federal agency have access to and use of information and data that is comparable to that provided to the members of the public without disabilities, unless it would impose an undue burden on the agency.

The Access Board was required to develop and publish technical and functional performance criteria to implement Section 508. In 2000, the Board published standards that apply to Web sites and applications; software applications and operating systems; computers, peripherals, and "self-contained, closed products"; and electronic content, including documents, audio, video, and multimedia. Federal agencies are required to comply with the Section 508 standards and to incorporate them into the procurement requirements for ICT products, professional services, and content procured from contractors and vendors.[6] The term "information and communication technology" is used throughout the NPRM preamble and proposed rule to broadly encompass electronic and information technology covered by Section 508, as well as telecommunications products, interconnected VoIP products, and CPE covered by Section 255. Examples of ICT include computers, information kiosks and transaction machines, telecommunications equipment, multifunction office machines, software, Web sites, and electronic documents.

The Access Board was also responsible for developing guidelines to implement Section 255 of the Communications Act of 1934, as amended, which requires telecommunications equipment manufacturers to ensure that a wide range of telecommunications equipment and services be made accessible when provision of such access is "readily achievable."[7]

In July 2010, the Access Board issued an ANPRM to solicit comment on revising, or "refreshing," the current Section 508 standards and Section 255 guidelines.[8] The Access Board

[6] The Federal Acquisition Regulatory (FAR) Council is responsible for issuing updated regulations that cover Federal Government purchases of ICT. DOJ periodically monitors and reports on Federal agency compliance with the Section 508 standards.

[7] The Federal Communications Commission (FCC) establishes regulatory requirements for telecommunications equipment manufacturers based on the Section 255 guidelines. The FCC also has statutory obligations under Section 255 and other enacted legislation to ensure the accessibility of various telecommunications services to people with disabilities.

[8] The text of the 2010 ANPRM is available at http://www.access-board.gov/attachments/article/560/draft-rule2010.pdf.

indicated in the 2010 ANPRM that it proposed to harmonize the updated Section 508 standards with the current version of WCAG 2.0, which was developed by the W3C to improve the accessibility of Web sites. WCAG 2.0 covers a wide range of recommendations for making Web content more accessible.[9] Following these guidelines will make content accessible to a wider range of people with disabilities, including blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech disabilities, photosensitivity, and combinations of these disabilities and conditions.

Under the Access Board proposal, these requirements would serve as the core set of standards applicable not only to the Web sites of Federal agencies and other affected entities, but also to software applications, data processing and communications hardware, and telecommunications equipment. In December 2011, the Access Board issued a second ANPRM seeking review and comment on a revised Board proposal that would specifically require ICT (including specified types of electronic content produced using ICT) to meet the Level A and Level AA Success Criteria and Conformance Requirements specified for Web pages in WCAG 2.0.[10]

The Access Board has received numerous comments on the two ANPRMs. In the NPRM, the Access Board is proposing to adopt the WCAG 2.0 Success Criteria and Conformance Requirements by reference as the core set of requirements in the proposed update of the current Section 508 standards and Section 255 guidelines. These standards would be applied not only to Web content, forms, and applications, but also to non-Web software, hardware and telecommunications equipment user interfaces, and electronic documents and other content. These core requirements would be supplemented with other consensus standards and guidelines that address specific ICT areas, including PDF accessibility and RTT protocols.

2. Framework to Evaluate the Proposed Standards and Guidelines

Econometrica was tasked with developing a preliminary regulatory evaluation of the benefits and costs of the proposed requirements in the NPRM. The impact of the proposed Section 508 standards was evaluated using the following framework:

- Identify, summarize, and compare U.S. and international standards and guidelines that currently address ICT accessibility.
- Describe the reasons why updated standards and guidelines are necessary.
- Obtain and analyze data on the numbers of Federal employees and U.S. residents with various types of disabilities who could benefit from updated and improved ICT accessibility standards.

[9] An explanation of how W3C approaches accessibility guidelines is available at http://www.w3.org/WAI/intro/components.php. An overview of the WCAG 2.0 standards begins on http://www.w3.org/WAI/intro/wcag.php.

[10] The text of the 2011 ANPRM is available at http://www.access-board.gov/guidelines-and-standards/communications-and-it/about-the-ict-refresh/draft-rule-2011.

- Identify and quantify (where possible) the potential benefits to Federal employees, citizens, and agencies.

- Obtain and analyze data on Federal agency components (e.g., departments or offices), Federal and economy-wide ICT expenditures, and ICT sector employment. These metrics were used to define and quantify the entities, purchases, and personnel that would be affected by the need to comply with the updated standards.
- Develop estimates of current and projected future ("baseline") Federal agency Section 508 compliance rates and the estimated costs to achieve this projected baseline level of compliance if the Section 508 standards are not updated.
- Identify provisions in the proposed standards that may result in increased compliance costs for Federal agencies and vendors, as well as provisions that may reduce the amount of time and effort required to comply with Section 508 or improve the ability of Federal employees to evaluate ICT to determine whether it meets the applicable standards.[11]
- Develop preliminary estimates of the net increase in compliance costs that would result from adopting the proposed Section 508 standards over a 10-year analysis period from 2015 through 2024.
- Identify and assess the significance of unquantifiable costs and potential cost savings to Federal agencies and contractors that could be expected to result from adopting the proposed standards and guidelines.

A similar approach could be followed to characterize and evaluate the societal impact of the proposed Section 255 guidelines. However, we could not locate adequate data to develop quantitative estimates of the impact of many provisions in the proposed Section 255 guidelines.

The rapid evolution of ICT devices, platforms, applications, and consensus standards complicates evaluation of the proposed regulatory requirements. Therefore, the benefits and costs of the proposed standards and guidelines ultimately depend not only on technologies that are currently available to achieve compliance, but also on emerging technologies that may provide better or more cost-effective options to ensure equal access to ICT for people with disabilities in the future.

3. Current Standards and Guidelines to Ensure Equal Access to ICT for People With Disabilities

The Access Board, DOJ, and the FCC each have defined responsibilities relating to the development and/or implementation of current Federal standards and guidelines designed to ensure equal access to ICT for people with disabilities.[12] In addition to the current Section 508

[11] Additional costs may be incurred by telecommunications and network equipment manufacturers to comply with the proposed update to the Section 255 guidelines. However, we were not able to develop quantitative estimates of these compliance costs.

[12] In addition, the U.S. Department of Transportation (DOT) has jurisdiction over the accessibility of ICT related to air transportation under the Air Carrier Access Act.

standards and Section 255 guidelines, Federal, State, and local government agencies, private for-profit and nonprofit entities, employers, and employees may be required to comply with other ICT-related accessibility obligations under Section 501 or 504 of the Rehabilitation Act of 1973. The FCC has also recently adopted or proposed requirements to implement accessibility regulations covering some telecommunications services and video programming mandated by the Twenty-First Century Communications and Video Accessibility Act (CVAA) of 2010.

Many State and local governments, public university systems, and libraries have also adopted (or, in some cases, have been required to adopt) policies or standards related to ICT accessibility. These standards typically reference or are partly based on requirements in the current Section 508 standards. In contrast, U.S. corporations and foreign governments seeking to ensure equal access to Web content and applications have typically done so by either referencing or adapting the WCAG 2.0 conformance requirements and success criteria.

3.1. Section 508 Standards

The Access Board standards implementing the requirements of Section 508 were published in December 2000. The Section 508 standards apply to all electronic and information technologies developed, procured, maintained, or used by Federal agencies and compiled in Section 508 of the Rehabilitation Act of 1973.[13]

Part 1194.22 of Section 508 covers Federal agency Web-based intranet and Internet information and applications. These requirements include 16 specific standards designed to ensure that Federal agency Web sites can be processed and interpreted by assistive technology (AT) such as screen readers. Other parts of Section 508 specify requirements applicable to software applications and operating systems, telecommunications products, video and multimedia products, "self-contained, closed products," and desktop and portable computers.

DOJ has periodically conducted surveys of Federal agencies to establish the level of Federal Government compliance with the Section 508 standards. A September 2012 DOJ report provides recent information on Federal agency compliance rates, activities, staffing, and expenditures.[14] These DOJ report results are used to establish baseline levels of compliance costs for Federal agencies under the current standards.

3.2. Section 255 Guidelines

Section 255 of the Communications Act of 1934, as amended, requires the Access Board to issue guidelines for manufacturers of telecommunications equipment and CPE to ensure that equipment is designed, developed, and fabricated to be accessible to and usable by individuals

[13] Section 508 accessibility standards, information on best practices, and links to training and technical support forums are available at www.section508.gov.

[14] DOJ, "Section 508 Report to the President and Congress: Accessibility of Federal Electronic and Information Technology," September 2012.

with disabilities when such access is readily achievable.[15] In 1998, the Access Board published the current Section 255 guidelines that cover telephone network equipment and CPE. CPE refers to telecommunications equipment used in the home or office (or other premises) to originate, route, or terminate telecommunications. Examples of CPE include telephones, fax machines, answering machines, and pagers. CPE that provides both telecommunications and non-telecommunications functions is covered only to the extent it provides telecommunications functions.[16] Interconnected VoIP equipment manufacturers are also subject to the Access Board's guidelines as a result of FCC rules issued in 2007.

While the Access Board's guidelines concern telecommunications product and equipment manufacturers, the FCC rules implementing Section 255 govern telecommunications products as well as services, including telephone calls, call waiting, speed dialing, call forwarding, computer-provided directory assistance, call monitoring, caller identification, call tracing, and repeat dialing. In addition, the rules implementing Section 255 cover voicemail and interactive voice response systems (phone systems that provide callers with menus of choices). In addition, the 2007 FCC rules extended Section 255 accessibility obligations to interconnected VoIP service providers.[17]

The more recently adopted CVAA addresses barriers to accessibility posed by advanced communications services. It contains an extensive list of requirements and a regulatory implementation schedule for the FCC. Advanced communications service coverage includes non-interconnected VoIP equipment and services, electronic messaging services (including email, instant messaging, and text messaging), and video conferencing:

- Section 716 of the CVAA requires providers of advanced communications services and manufacturers of equipment used for advanced communications services to ensure that their services and equipment are accessible to and usable by individuals with disabilities, unless doing so is not achievable with "reasonable effort or expense."[18] The FCC adopted regulations partly implementing Section 716 in its October 7, 2011, Report and Order and published additional regulations on April 29, 2013.
- Section 718 of the CVAA requires mobile phone service providers and manufacturers to make Internet browsers built into mobile phones accessible to and usable by people who are blind or have a visual impairment, unless doing so is not achievable. The FCC issued regulations implementing Section 718 in its April 29, 2013, Report and Order.

[15] Where accessibility is not readily achievable, Section 255 requires manufacturers to make their devices compatible with peripheral devices and specialized CPE that are commonly used by people with disabilities, if providing this compatibility is readily achievable.

[16] The current Section 255 guidelines define CPE as "equipment employed on the premises of a person (other than a carrier) to originate, route, or terminate telecommunications," while telecommunications equipment is defined as "equipment, other than customer premises equipment, used by a carrier to provide telecommunications services, and includes software integral to such equipment (including upgrades)."

[17] See FCC, "Tentative Findings on Accessibility of Communications Technologies," CG Docket No. 10-213, August 23, 2012.

[18] The Section 716 requirements do not apply to equipment already covered under the Section 255 guidelines.

3.3. W3C Consensus Standards

The W3C is an international community of Web programmers and users that develops technical specifications and guidelines for Web site technology. The W3C Web Accessibility Initiative (WAI) has developed and adopted two sets of consensus Web site accessibility guidelines. WCAG 1.0, published in 1998, provided the foundation for a significant part of the current Section 508 standards relating to Web site (and other ICT) accessibility.[19]

WCAG 2.0, published 10 years later on December 11, 2008, represented a comprehensive update and revision of these standards. WCAG 2.0 covers a wide range of recommendations for making Web content more accessible. Following these guidelines will make content accessible to a wider range of people with disabilities, including blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech disabilities, photosensitivity, and combinations of these disabilities or conditions.[20]

WCAG 2.0 is organized around four principles that ensure that Web sites are accessible for people with various types of disabilities:

1. Information and user interface components must be presentable to users in ways they can **perceive**.
2. User interface components and navigation must be **operable**.
3. Information and the operation of user interface must be **understandable**.
4. Content must be **robust** enough that it can be interpreted reliably by a wide variety of user agents, including ATs.

WCAG 2.0 applies broadly to more advanced technologies than WCAG 1.0. It is easier to use and understand and is more precisely testable with automated testing and human evaluation. The performance criteria specified in each section of WCAG 2.0 are widely regarded to be operationally achievable, measurable, and potentially enforceable.[21] In contrast, elements of both WCAG 1.0 and the current Section 508 standards that address some of the same accessibility issues are difficult to measure and evaluate consistently.

In February 2014, the European Telecommunications Standards Institute (ETSI) published a new standard—EN 301 549—that uses the WCAG 2.0 Level A and Level AA Success Criteria as the basis to evaluate accessibility for all covered Web and non-Web electronic content.[22] Foreign government Web site accessibility requirements are also typically defined by reference to, or are

[19] The Access Board has determined that 11 of the 16 Section 508 requirements relating to Web sites are consistent with specific WCAG 1.0 Priority 1 checkpoints. Several of the remaining requirements address accessibility issues that were also covered in the WCAG 1.0 standards.

[20] Both WCAG 1.0 and WCAG 2.0 have three nested levels of standards that afford increasing levels of accessibility. The WCAG 1.0 standards are categorized as Priority Levels 1, 2, or 3. The WCAG 2.0 standards are specified at the A, AA, and AAA levels. WCAG 1.0 Priority Level 1 and WCAG 2.0 Level A represent the least extensive set of requirements.

[21] W3C provides extensive guidance, examples, best practices, and resources for complying with the WCAG 2.0 specifications.

[22] ETSI, "Accessibility requirements suitable for public procurement of ICT products and services in Europe," EN 301 549 V1.1.1 (2014-02).

largely based on, WCAG 2.0. Australia, Canada, Hong Kong, and New Zealand Government sites are or will be required to meet the WCAG 2.0 Level A and Level AA Success Criteria and Conformance Requirements. France and Germany have national standards that are based on but not identical to WCAG 2.0 (Level AA), while United Kingdom Government Web sites are required to comply with either WCAG 1.0 or 2.0 at the AA level.[23]

3.4. Sections 501 and 504 of the Rehabilitation Act of 1973

Federal agencies and recipients of funding are subject to additional obligations to accommodate employees and ensure access for programs and activities under other parts of the Rehabilitation Act of 1973. Section 501 requires affirmative action and prohibits discrimination in employment by Federal agencies of the Executive branch of Government. Federal agencies are required to provide reasonable accommodation for Federal employees with disabilities, including provision of accessible ICT and electronic content, unless doing so would cause undue hardship.[24]

Section 504 requires that qualified individuals with disabilities must not be excluded from, denied access to, or subjected to discrimination under any program or activity that either receives Federal financial assistance or is conducted by any Executive agency or the U.S. Postal Service (USPS). Each Federal agency has its own Section 504 regulations that apply to its own programs, and agencies that provide financial assistance have regulations that cover entities receiving Federal aid. Employees must be provided with reasonable accommodations, as well as access to participation in all programs, facilitated communication for people with hearing or vision disabilities, and accessible construction and alterations.[25]

It is important to note that Federal agency compliance with the Section 508 standards does not ensure that it has fully discharged its obligations to employees or the public under Section 501 or Section 504. For example, the applicable Department of Health and Human Services guidance notes in part:

> An agency may, in some instances, be able to meet its Section 504 obligation to provide equal opportunity to persons with disabilities and ensure effective communication by making information available in a Section 508-compliant form on its external-facing website or intranet(s). However, in other cases, in order to meet its Section 504 obligation, an agency may need to provide an appropriate auxiliary aid to an individual with a disability, regardless of whether information on its website meets accessibility requirements under Section 508.[26]

[23] Mark Rogers, "Government Accessibility Standards and WCAG 2.0," Power Mapper Software Blog, posted November 13, 2012.
[24] A reasonable accommodation is any change in the work environment or in the way a job is performed that enables a person with a disability to enjoy equal employment opportunities.
[25] See DOJ Disability Rights Office, "A Guide to Disability Rights Laws," last updated July 2009.
[26] HHS.gov, "Clarification: Compliance with Sections 504 and 508 of the Rehabilitation Act."

4. An Overview of the Proposed 508 Standards and 255 Guidelines

4.1. Need for Revision of Current Standards and Guidelines

The requirements in the current Section 508 standards and Section 255 guidelines are product or technology specific rather than being based on the functionality of the ICT. During the past 15 years, previously distinct technologies have converged, and users are increasingly able to perform the same tasks using devices and software that are subject to different accessibility requirements. In addition, some newer technologies (e.g., JavaScript menus on Web sites, mobile phone interfaces) can pose accessibility issues that did not exist at the time the current standards were published. Inter-device and platform interoperability and compatibility have become more important as the numbers and capabilities of ICT products, applications, and content have proliferated. Businesses and foreign governments have adopted new or revised accessibility requirements that reference, or are based on, voluntary consensus standards for electronic applications, content, and devices to address the challenges posed by convergence and need for interoperability.

In addition, Federal agencies have had to develop additional requirements and guidance for ICT professionals, contracting personnel, and other employees and contractors with Section 508 compliance responsibilities because the many provisions of the current standards are not measureable or testable. To address the inefficiencies that resulted from each agency needing to develop supplemental requirements, guidance, and testing protocols, the Federal Government has undertaken several ICT initiatives that support uniform cross-agency ICT requirements, compliance guidance, and evaluations of products and services. Consequently, the standards that many Federal agencies now use to measure accessibility have evolved significantly from those specifically set forth in the published requirements.

The Access Board NPRM proposes to update and unify the current Section 508 standards and 255 guidelines, largely by recognizing and leveraging voluntary consensus standards and current ICT industry practices. By doing so, the Federal Government and telecommunications manufacturers would be able to ensure the accessibility of ICT covered under the Section 508 standards or Section 255 guidelines using a set of functionality-based requirements that are harmonized with those already established in other sectors.

The Access Board considered two alternative approaches to updating the current Section 508 standards or Section 255 guidelines:

1. In the 2010 ANPRM, the Board proposed a set of requirements that were based on but not identical to the WCAG 2.0 standards and other voluntary consensus standards. Comments received from stakeholders and the public indicated that this approach was potentially confusing, as Federal agencies, contractors, and vendors would have to make specific compliance determinations in cases where the language used in the proposed Section 508 standards differed from that in the referenced standard.
2. The Board also considered requiring ICT to be compliant with the full set of Functional Performance Criteria, which state in general terms the features of ICT that ensure its

accessibility to people with one or more of eight different types of vision or hearing disabilities or manipulation, reach, or strength limitations (collectively referred to in this evaluation as "addressable disabilities"). Comments from stakeholders—including the Cellular Telecommunications Industry Association and the Software & Information Industry Association (SIIA)—indicated that this approach would make it difficult for ICT creators to be able to determine whether or not their products and services were compliant with the proposed Section 508 standards.

Based on the comments received in response to the 2010 and 2011 ANPRMs, the Board determined that the clearest and most efficient way to set out the proposed accessibility requirements was to identify and reference existing consensus standards directly wherever possible.

The Access Board is therefore proposing to update the Section 508 standards and Section 255 guidelines in large part by referencing the applicable Level A and Level AA Success Criteria and Conformance Requirements specified for Web pages in WCAG 2.0.[27] There are several advantages to using this approach to update the current standards and guidelines:

- Referencing WCAG 2.0 is consistent with Office of Management and Budget (OMB) Circular A-119, which directs agencies to use voluntary consensus standards in lieu of government-unique standards, except where inconsistent with law or otherwise impractical. The primary benefit is economic in that this practice can reduce costs to the Government associated with developing its own standards and can also decrease the cost of goods and services procured by the Government. Fragmentation of standards is an economic issue for the Government, businesses, and Web developers.
- WCAG is written to be technology neutral. The convergence of telecommunications and data processing equipment and services means that an increasing variety of devices are being used to perform a common set of functions and activities. Some significant trends directly affect the application of Section 508 standards to current ICT:[28]
    - Wireless telecommunications devices are now capable of running sophisticated software applications that do not involve voice communications.
    - Office computing functions are typically performed in a device-independent environment on network servers or, increasingly, in the "cloud."
    - Enterprise copiers, printers, and scanners have been replaced by multifunction machines that have characteristics of both computer peripherals and photocopying equipment.

[27] A provision-by-provision comparison of the WCAG 2.0 and Section 508 standards is available on the Access Board Web site.

[28] The preamble notes that "WCAG 2.0 addresses new technologies and is responsive to the fact that the characteristics of products, for example native browser behavior and plug-ins and applets, have converged over time. Today, there are fewer distinctions among product categories, and some are outdated. For example, modern smart phones include software applications and operating systems, Web-based intranet and Internet information and applications, and video and multimedia products. Additionally, smart phones are portable computers, telecommunications products, and self-contained closed products."

- Mobile Web content and applications emerged several years after the WCAG 1.0 and current Section 508 standards were developed. There is substantial overlap between the WAI-published Mobile Web Best Practices/Mobile Web Applications Best Practices guidelines and the WCAG 2.0 standards.[29]
- Adoption of new technologies and programming techniques has generated new accessibility obstacles that did not exist when the current Section 508 standards were developed.[30]
- The WAI provides an open and autonomous process for providing periodically improved supplementary guidance materials for their standards. These techniques and understanding documents are not requirements, but they are very useful.[31]
- The WAI provides an open and autonomous process for updating complementary standards, such as the Authoring Tools Accessibility Guidelines and User Agent Accessibility Guidelines (ATAG and UAAG, respectively).[32]

In addition to the proposed Access Board update of the current Section 508 standards and Section 255 guidelines, comparable accessibility requirements have been adopted or are currently being proposed in other current Federal agency rulemaking proceedings that would apply to providers of passenger air transportation and private-sector entities that operate public accommodations:

- A 2013 Rule published by DOT promulgated WCAG 2.0-based requirements to ensure that the Web sites of U.S. and foreign carriers marketing air transportation in the United States would be accessible to people with disabilities.[33]
- DOJ issued an ANPRM in 2010 indicating that the Department was considering revising the current ADA Title III regulations to establish requirements to ensure that goods, services, facilities, privileges, accommodations, or advantages offered by public accommodations via the Internet would be accessible to individuals with disabilities. The ANPRM also stated that "the Department is also considering revising the ADA Title II regulations to establish requirements for making the services, programs, or activities offered by State and local governments to the public via the Web accessible.[34]

[29] Mappings of the differences between WAI Mobile Web Best Practices and the WCAG 2.0 (and 1.0) standards are provided in links from W3C, Web Accessibility Initiative, "Web Content Accessibility and Mobile Web: Making a Website Accessible Both for People with Disabilities and for Mobile Devices," updated August 31, 2012.

[30] For example, the current Section 508 standards do not contain explicit requirements for keyboard operability because 2000-era Web pages were always keyboard operable. As Web technologies have become more complex, mouse or touch-only interfaces have not always preserved keyboard operability.

[31] A page that describes the different WCAG 2.0 technical documents is available at http://www.w3.org/WAI/intro/wcag20, updated December 17, 2008.

[32] A new regulatory proceeding would be required to rule the proposed Section 508 standards and Section 255 guidelines to reference future updates to any of these WAI-developed standards.

[33] DOT, "Nondiscrimination on the Basis of Disability in Air Travel: Accessibility of Web Sites and Automated Kiosks at U.S. Airports," Final Rule, DOT–OST–2011–0177-0006, November 12, 2013.

[34] DOJ, "Nondiscrimination on the Basis of Disability: Accessibility of Web Information and Services of State and Local Government Entities and Public Accommodations," ANPRM, DOJ–CRT–2010–0005–0001, July 26, 2010.

As noted above, WCAG 1.0 and 2.0 are also internationally recognized standards for Web site accessibility, whereas Section 508 is specific to ICT procured, developed, maintained, or used by the U.S. Government.

4.2. WCAG 2.0 and Other Proposed Accessibility Standards: What Would Be Required?

WCAG 2.0 Level AA conformance includes 38 success criteria, most of which relate to issues that are also addressed in the current Section 508 standards for Web pages, content, forms, and applications. The Access Board has determined that 22 of the 38 specific WCAG 2.0 Level A and Level AA Success Criteria are "substantially equivalent" to provisions in the current Section 508 standards. These provisions are identified in Table A-1 of Appendix A.

There are 16 WCAG 2.0 standards that could be considered "new" in the context of the current Section 508 standards. The majority of these are consistent with current industry standards or common ICT user expectations:

- Five requirements specify the organization and coding of Web pages and electronic content to ensure that the order and navigation are clear and consistent. Compliance with these standards is consistent with reasonable structure and presentation of electronic content for all audiences, rather than specifically for those with addressable disabilities.[35]
- Four provisions state standard or recommended Web and software programming requirements.[36]
- Two standards for handling forms and transactions would be desirable to incorporate into any ICT, irrespective of accessibility considerations.[37]
- One standard provides all Web or multimedia users with the ability to control audio content that would otherwise be impossible to pause or interrupt.[38]

The remaining 4 of the 16 "new" WCAG 2.0-based standards are specifically focused on the presentation of visual and audio information in ways that can be accessible to people with addressable disabilities. These include the requirements for minimum levels of color contrast, user ability to resize text, ability to understand instructions without reliance on specific sensory capabilities, and ability to navigate in multiple ways.[39]

The Access Board is also proposing to incorporate references to other voluntary international consensus standards that address specific ICT accessibility issues:

[35] The referenced WCAG 2.0 standards are the requirements relating to meaningful sequence (1.3.2), focus order (2.4.3), link purpose (2.4.4), headings and labels (2.4.6), and consistent navigation (3.2.3).
[36] The referenced WCAG 2.0 standards are the requirements relating to avoiding keyboard traps (2.1.2), specifying the language of pages and parts of pages (3.1.1 and 3.1.2), and parsing of code (4.1.1).
[37] The referenced WCAG 2.0 standards are the requirements relating to error suggestion and prevention (3.3.3 and 3.3.4).
[38] The referenced WCAG 2.0 standards are the requirements relating to audio control (1.4.2).
[39] The referenced WCAG 2.0 standards are the requirements relating to reliance on sensory characteristics (1.3.3), contrast (1.4.3), resizing of text (1.4.3), and providing multiple ways to find content (2.4.5).

- Compliance with the International Standard for Accessible PDF Technology (PDF/UA-1) is proposed as an optional alternative for PDF files. PDF/UA-1 provides a technical, interoperable standard for the authoring, remediation, and validation of PDF content to ensure accessibility for people with disabilities who use assistive technology such as screen readers, screen magnifiers, joysticks, and other ATs to navigate and read electronic content.
- RTT functionality would be required where ICT provides real-time, two-way voice communication (such as telephones, webinars, and videoconferencing technology). Features capable of text generation would have to be compatible with real-time voice communication used on a network. ICT would be required to interoperate either within its own closed system or outside a network.

Other proposed requirements include referenced standards applicable to software user interfaces, hearing aid compatibility with wireless communications devices, digital television processing of audio description, and other technical issues. A complete list of the referenced standards is provided in section E102 of the proposed rule text.

4.3. ICT Content, Applications, and Equipment: What Would Be Covered?

The current Section 508 standards cover six specific categories of ICT:

- Software applications and operating systems.
- Web-based intranet and Internet information and applications.
- Telecommunications products.
- Video and multimedia products.
- Self-contained, closed products.
- Desktop and portable computers.

The current Section 508 standards also apply to electronic documents and other electronic content created by Federal employees or contractors, although the types of content that must be made accessible are not specified in the rule text.

The current Section 255 guidelines cover the following:

- Wired and wireless telecommunication devices such as telephones (including pay phones and cellular phones), pagers, and fax machines.
- Other products that have a telecommunication service capability, such as modems connected to computers and interconnected VoIP equipment.
- Equipment that carriers use to provide services, such as phone company switching equipment.

The proposed update of the current Section 508 standards and Section 255 guidelines would base accessibility requirements on ICT functionality (e.g., programs, video, audio, documents) rather than the specific technology through which the content or application is developed or distributed.

Proposed requirements dealing with video accessibility for people with vision-related disabilities would apply to displays on Web sites, software applications, and multifunction machines. Audio players on Web sites or on telecommunications products and desktop computers would need to provide accessible controls. Proposed AT compatibility requirements would apply to all electronic devices defined as ICT.

4.3.1. Covered Categories of Electronic Content

Although the proposed scoping definitions apply to most ICT equipment and services covered under the current Section 508 requirements, the types of electronic content that would fall under the purview of the proposed standards would be defined in more specific terms. The Access Board is proposing to provide a list of covered forms of electronic communications originated or disseminated by the Federal Government or its employees based on the type of content:

1. Public-facing content.
2. Official business content communicated by an agency through one or more of the following:
    a. An emergency notification.
    b. An initial or final decision adjudicating an administrative claim or proceeding.
    c. An internal or external program or policy announcement.
    d. A notice of benefits, program eligibility, employment opportunity, or personnel action.
    e. A formal acknowledgement or receipt.
    f. A questionnaire or survey.
    g. A template or form.
    h. Educational or training materials.

The Access Board considers that these categories of electronic content represent the official agency communications that are most likely to affect a significant number of employees and members of the public with disabilities.

4.3.2. Application of WCAG 2.0 to Non-Web ICT

In addition to electronic documents, hardware, software (including firmware, platforms, and applications), and ICT support documentation and services would continue to be covered under the proposed standards. Telecommunications equipment (whether sold to the Federal Government or other customers) would also be required to comply with the applicable WCAG 2.0-based requirements in the proposed update to the Section 255 guidelines.

The Access Board is also proposing additional requirements that are specifically applicable to software, hardware, and telecommunications equipment. Additional information about individual WCAG 2.0 standards and the proposed additional requirements for software, hardware, and telecommunications equipment is provided in Appendix A.

4.4. Major New Requirement Areas in the Proposed Standards and Guidelines

This assessment identifies 11 areas in which the proposed requirements represent potentially significant changes from current ICT standards and guidelines:

1. Applying WCAG 2.0 to software and applications.
2. Accessibility features within software applications and operating systems.
3. Authoring tools.
4. Assistive technology.
5. Electronic content and data.
6. Color and contrast settings.
7. Audio control on Web pages.
8. User control for captions and video description.
9. RTT functionality.
10. ICT hardware accessibility.
11. Online product documentation and support services.

A brief discussion of each area of the proposed revisions with potentially significant impact follows.

4.4.1. Area 1: Applying WCAG 2.0 to Software and Applications

The proposed rule would apply the WCAG 2.0 Success Criteria Level A and Level AA not only to Web pages, but also to software platforms, toolkits, and applications. Software applications and operating systems are required to meet the accessibility requirements set forth in section 1194.21 of Section 508. As noted in Appendix A, most of these requirements have analogues in the WCAG 2.0 Success Criteria.[40]

While WCAG 2.0 was developed specifically to address accessibility issues with Web-based content, forms, and applications, the NPRM explains the rationale for applying these standards to non-Web ICT:

> Because WCAG 2.0 was written to be technology neutral, the language and phrasing of the Success Criteria can be applied to any technology found on the Web. Since most file types are found on the Web and much software is now Web-enabled, it is reasonable to utilize WCAG 2.0 to evaluate off-line documents and software interfaces with straightforward substitution of terms to address this new application. This approach has the potential to significantly simplify accessibility conformance and assessment.

[40] Some of the WCAG 2.0 criteria would be applied more broadly than their counterparts in the current Section 508 standards. For example, the WCAG 2.0 requirement (3.2.4) to provide consistent identification of components with the same functionality within a set of Web pages in cases would supersede the current Section 1194.22(e) requirement that is limited to identification of components using bitmap images.

The W3C has developed a working draft guidance document that provides support for the prospective application of WCAG 2.0 recommendations to non-Web ICT. More information on this guidance is provided in Section A.2 of Appendix A.[41]

4.4.2. Area 2: Accessibility Features in Software Applications and Operating Systems

In addition to requiring compliance with the applicable WCAG 2.0 Success Criteria, the NPRM includes three additional sets of proposed requirements for software applications and operating systems. The first set addresses the need to ensure that AT that uses standard accessibility services is interoperable with software platforms, toolkits, and applications. Software platforms would be required to provide a specified list of documented accessibility services, typically through the means of application programming interfaces (APIs). [42]

4.4.3. Area 3: Authoring Tools

The proposed standards for software accessibility would also extend beyond the WCAG 2.0-based requirements for applications that function as "authoring tools"—programs that are used to create other applications or electronic content.[43] The current Section 508 standards have no explicit requirements specifically relating to authoring tools. The proposed standards would require authoring tools to provide a mode of operation that would allow users to create or edit WCAG 2.0-compliant content, preserve information required for accessibility, provide user prompts that would proactively support the creation of accessible content, and provide a range of templates (where templates are provided) that facilitate the creation of accessible content.

Software applications that function as authoring tools currently provide varying capabilities to support incorporating accessibility in the design of content and forms and to evaluate the accessibility of material created in other applications.[44] The W3C developed and published the first consensus set of authoring tool accessibility guidelines (ATAG 1.0) in February 2000. However, we were not able to identify currently marketed software applications that are able to claim conformance with the ATAG criteria.

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[41] W3C, "Guidance on Applying WCAG 2.0 to Non-Web Information and Communications Technologies," Working Draft, September 5, 2013. Development of this guidance was prompted in part by some industry association comments on the two Access Board ANPRMs that indicated that there may be issues in applying the WCAG 2.0 standards to non-Web ICT. See Joint Comments of the Telecommunications Industry Association (TIA) and CTIA – the Wireless Association, Docket No. 2011-07, March 7, 2012, and SIIA, Comments to Access Board on Electronic Accessibility, Docket No. 2011-07, March 7, 2012. SIIA recommended that "the Access Board work together with the W3C, international technical experts, and industry participants to assess how the principles in WCAG 2.0 can be applied in various non-web contexts and develop interpretations or extensions of these principles that are appropriate for these different contexts."

[42] According to Wikipedia, "an application programming interface (API) specifies how some software components should interact with each other….In practice, many times an API comes in the form of a library that includes specifications for routines, data structures, object classes, and variables."

[43] Examples of authoring tools include office suites such as Microsoft Office, design suites such as Adobe Creative Suite, database development tools provided by companies such as Oracle, and programming applications.

[44] For example, Adobe Acrobat XI advertises an expanded set of tools to detect violations of current Section 508 requirements in content imported from a wide range of applications.

An updated set of guidelines (ATAG 2.0) is currently being finalized.[45] Some open-source authoring tools including Drupal, a content management system used to develop a large number of Federal Government Web sites, have evaluated their conformance with ATAG 2.0. These evaluations have indicated that many elements of conformance have not yet been realized.[46]

4.4.4. Area 4: Assistive Technology

Another proposed set of software-related accessibility requirements are intended to ensure the interoperability of software that functions as AT with software platforms that provide standard accessibility services.

As is the case with ICT generally, assistive technology can be provided in both physical (hardware) and virtual (software) forms. The National Center for Accessible Media lists the following forms of AT used in conjunction with Web sites and software applications:[47]

- Screen readers.
- Refreshable Braille displays.
- Screen magnifiers.
- Adaptive keyboards.
- Voice-recognition software.

The current Section 508 standards have no explicit requirements for assistive technology. Current practice is typically to have an API built into the main product to interact with AT or to have products with built-in accessibility features so that no AT is needed.

4.4.5. Area 5: Electronic Content and Data

Electronic content, including documents, spreadsheets, presentations, photos, and audio and video clips, is not specifically included in the definitions of "electronic and information technology" or "information technology" in the current Section 508 standards. However, the Access Board has interpreted the standards to cover electronic documents and other forms of electronic content, irrespective of whether or not these materials are available through a public-facing Web site.

The proposed standards add a definition of "electronic content," list specific categories of electronic content that must be made accessible, and reference the WCAG 2.0 Level A and Level AA Success Criteria as the benchmark for determining whether covered electronic content is accessible.

Our interviews with agency representatives indicated that significant attention and resources have only recently been devoted to expanding the accessibility of electronic content accessible

[45] W3C, "Authoring Tool Accessibility Guidelines (ATAG) 2.0," W3C Candidate Recommendation, November 7, 2013. The W3C Web site indicates that "ATAG 2.0 is being developed to be compatible with WCAG 2.0. WAI anticipates ATAG 2.0 will be completed in 2014. Because of the nature of the W3C development process, WAI cannot be certain when the final version of ATAG 2.0 will be available. ATAG 1.0 will remain the latest approved version until version 2.0 is complete. Currently, ATAG 2.0 is a mature draft and we expect that it will not change significantly. We recommend that you use the ATAG 2.0 draft in most cases, understanding that it might change."
[46] Drupal Groups, "Drupal compliance overview of ATAG 2.0," continuously updated.
[47] National Center for Accessible Media, "Accessible Digital Media Guidelines: Tools for Access."

beyond content posted on Federal Government Web sites. Agencies with different capabilities and resources have achieved varying degrees of success in making specific categories of non-Web electronic documents and content accessible thus far.

Substantial resources are currently available for creators and editors who need to ensure that their electronic content is accessible. Several components of the Federal Government provide comprehensive "how to" portals and sites with best practices and guidance for the most common desktop software applications:[48]

- Department of Health and Human Services, Making Files Accessible.
- General Services Administration, GSA 508 Tutorials, Guidance, Checklists.
- Social Security Administration, Resources for Developers and Document Authors.

As noted above, software vendors also provide users with extensive assistance on producing accessible content.

4.4.6. Area 6: Color/Contrast Settings and Text Resizing

The current Section 508 standard includes several provisions governing color and contrast, including the following parts of Section 1194.21:

> (i) Color coding shall not be used as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.
>
> (j) When a product permits a user to adjust color and contrast settings, a variety of color selections capable of producing a range of contrast levels shall be provided.

However, these requirements arguably are vague and lack sufficient detail to be testable, whereas the proposed standards provide testable requirements for electronic content, software applications, and operating systems. In most cases, visual presentation of text and images of text would be required to have a contrast ratio of at least 4.5:1.[49]

The current Section 508 standards do not address the ability of users to resize the display of text and other content. The Access Board proposal would require Web pages and non-Web user interfaces to be readable and retain their functionality when the text size is doubled.[50]

4.4.7. Area 7: Audio Controls on Web Pages

The current Section 508 standards have no explicit requirements for separate controls to adjust volume or to stop and start audio on Web pages or in software applications.[51] The proposed

[48] It should be noted that many of these resource portals are more difficult to locate than the more general accessibility policy and compliance directive content on the same agency Web sites. This could be remedied at relatively minimal cost by adding a dedicated page on http://www.section508.gov.

[49] For example, meeting this standard would require that text in standard blue (color code #0000ff) be displayed on a background that is appreciably lighter than a medium gray (#a3a3a3).

[50] Contrast and font size have interactive effects on readability—larger fonts can be read more easily, as can higher contrast pages. The WCAG standard allows a ratio of 3:1 for larger font sizes, for example. In addition, size and color are two attributes of text display that can be set in the same manner in HTML and other applications.

[51] Web-embedded video and audio content often plays automatically without the user attempting to play it. The proposed requirements would provide users with the ability to control this "autoplay" feature, which can interfere with the ability of the user to hear the audio playback they are receiving from a screen reader.

standards would incorporate by reference the applicable WCAG 2.0 Level A success criterion (1.4.2) that allows users of screen-reading software to control other audio (e.g., turn down the volume or turn it off) on a Web page in order to hear the screen reader.

4.4.8. Area 8: User Controls for Captions and Video Description

The current Section 508 standard does not require Web pages, software, telecommunications equipment, and other forms of hardware to make user controls for captions and audio description available in any particular form or location. The proposed rule would include new requirements for the location of these controls. In response to the 2010 ANPRM, consumer groups reported complaints that some modern products did not support captioning when in fact the problem was that the captioning selection was very difficult to find in the menus. The proposed rule would increase the usability of captioning features by making controls more prominent and easy to find.

Some Web-based and software media players already have captioning or audio description available. These applications would have to be redesigned to feature the controls more prominently. Media players without these capabilities would need to be redesigned to incorporate these capabilities, or Web and software developers could choose to embed an accessible media player in their content or applications.

Hardware manufacturers would need to modify the physical design and features of covered products that currently lack this capability and update software platforms and applications to support the required controls.

4.4.9. Area 9: RTT Functionality

The current Section 508 standards and Section 255 guidelines include functionality requirements for teletypewriters (TTYs). A TTY is often used to place a call to a Telecommunications Relay Service (TRS), which enables individuals who are deaf or hard of hearing to make successful phone calls to hearing phone users. The FCC estimates that there are about 100,000 TTY users. However, TTY usage is currently declining by 10 percent annually and is expected to fall to half the current level in 7 years.[52]

The Access Board is proposing requirements regarding text-based data transmission in real time. RTT has more features and functions than TTYs.[53] In 2011, the FCC Emergency Access Advisory Committee (EAAC) sponsored a survey of people with disabilities to characterize their current and preferred means of being able to communicate with emergency services dispatchers. While the results of the survey cannot be generalized, 46 percent of those who responded to the survey reported wanting to be able to use "real-time text, where the 9-1-1 center reads the characters a caller types as soon as the person types them and the caller sees the characters that the 9-1-1 dispatcher types back as soon as they type them."[54]

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[52] FCC, Emergency Access Advisory Committee (EAAC) Report on TTY Transition, March 2013.

[53] RTT can be used in conjunction with voice and/or video in a multimedia communication or on its own, on fixed or mobile accesses. RTT allows a more natural, bidirectional flow of conversation to take place, compared to the technology of instant messaging or mobile phone text messaging. RTT can also be used by relay services to offer real-time conversion between different modes of communication to enable people who are deaf or hard of hearing or who have a speech impairment to use the emergency services without limitations.

[54] FCC EAAC, Report on Emergency Calling for Persons with Disabilities: Survey Review and Analysis, July 21, 2011.

In Section 5.4 of the NPRM, the Access Board states that:

> RTT is sufficiently mature as a technology (and has sufficiently proliferated the current ICT marketplace) to warrant coverage in the proposed rule. For example, real-time instant messaging programs such as those currently used by Yahoo! Messenger and AOL Instant Messaging with Real-Time IM have proprietary protocols that are very similar to Session Initiation Protocol (SIP).

The Telecommunications and Electronic and Information Technology Advisory Committee (TEITAC) recommended that, where ICT supported real-time voice conversation, it should also support a method of RTT communication. The TEITAC report stated that its recommendations were intended to allow people with disabilities to communicate using standard IP methods rather than continuing to support TTY within IP networks and devices.[55]

The benefits of RTT to users with disabilities over other text communication options are outlined in a proposal submitted by the Rehabilitation Engineering Research Center for Telecommunications Access to the TEITAC.[56] Those benefits include the following:

- RTT is continuous and contemporaneous, like voice and signed communication.
- Delivery is instant and letters are viewed as they are typed.
- Both parties are online simultaneously, as during phone calls.
- In time-sensitive situations, time is saved because the receiver can see the text as it is typed and can interact to confirm contemporaneously, instead of having to wait until completion and transmission to read and react.
- Typing errors are visible during typing and can be corrected after transmission.

The TRACE Proposal further explained that RTT minimizes the occurrence of crossed messages, which occur when one party sends a second message before the other party finishes answering the first. In an emergency, a panicked caller sometimes asks a second or third question when there is no immediate visible response from the 911 call taker, and this can lead to confusion, crossed answers, and error in responses.

One of the most attractive aspects of RTT functionality is the communication advantage it might provide to users with disabilities in emergency situations. In support of its efforts to develop a standardized method for text to 911, the FCC collected extensive input from the disability community and service providers through an EAAC, established by the FCC pursuant to the CVAA, Pub. L. No. 111-260. FCC's multiyear effort looked at a variety of text-to-911 options, including RTT and short message service (SMS). In August 2014, the FCC announced an interim solution that relied on SMS.[57]

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[55] TEITAC Report, pp. 8, 9.

[56] Rehabilitation Engineering Research Center for Telecommunications Access, Proposal R1 for Implementation of Real-Time Text Across Platforms Version 2.0, 7-8, 14-15 (Dec. 2013) (hereafter, "TRACE Proposal").

[57] In re Facilitating the Deployment of Text-to-911 and Other Next Generation 911 Applications, Framework for Next Generation 911 Deployment, PS Docket Nos. 11-153 and 10-255, *Second Report and Order and Third Notice*

The FCC stated in its report that enabling direct text messaging to 911 by the many people who are deaf, hard of hearing, or speech disabled will allow them to use mass market communication devices that have more advanced and increasingly evolving capabilities. The FCC found that, "while some commenters have been less supportive of SMS-to-911 because it does not support real-time text—i.e., the ability to send and receive text simultaneously with the time that it is typed without having to press a "send" key—they have given some support to SMS as a viable near-term solution because of its ease of use for people with disabilities and ubiquity in mainstream society." Respondents to an EAAC survey "expressed a clear preference for calling a PSAP using the same technology that they use on a daily basis. Furthermore, 87.7 percent of EAAC respondents reported having used SMS text messaging and 46.1 percent reported having used SMS text messaging 'almost every day.'"[58]

The Access Board understands the FCC decision to rely on an SMS-based approach to be largely because SMS-based text messaging is ubiquitous—it is widely used by individuals with disabilities and technically feasible for all covered providers to support it—allowing for rapid implementation of the interim solution. However, a dissenting statement of one commissioner expressed serious concerns with the FCC's reliance on an SMS-based approach, including the following: only a small percentage of public safety answering points (PSAPs) currently accept text messages, SMS-based transmission fails when a phone is in "roaming" mode, if a user's plan does not have an SMS subscription, and many popular texting apps would not be covered. The dissent advocated strongly for moving directly to reliance on IP-based RTT.[59]

In its report, the FCC announced that it was seeking comment "on the delivery of real-time text communications to PSAPs, wherein the text is transmitted as it is typed. The EAAC recommended that 'standards and functional requirements be adopted that are technically and economically feasible' to achieve direct access to 911 using, among other IP-based text communications, real-time text communications. The Access Board notes that RTT differs from traditional forms of text communications such as SMS, in that it provides an instantaneous exchange, character by character or word by word, whereas SMS and other traditional forms of text communications require uses to finish their typed message before sending it. According to the Rehabilitation Engineering Research Center for Telecommunications Access (RERC-TA), in an emergency, real-time text can allow for interruption and reduce the risk of crossed messages because the PSAP call taker is able to read the caller's message as it is being typed, rather than waiting until the caller presses the 'send' key."[60]

The Access Board sees its proposal to require ICT that supports real-time voice communication to also support RTT as complementing the FCC's work in the area of text to 911. The FCC strove to select an interim solution for text to 911 that was already widely used and that individuals with disabilities were familiar with and comfortable using. The FCC makes clear in its report that, "while the Commission continues to explore the feasibility of real-time text

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of Proposed Rulemaking, 29 FCC Rcd. 9846 (Aug. 2014) (hereafter, FCC Second Report and Order); see also 79 Fed. Reg. 55,367 (September 16, 2014) (publication of final rule).

[58] FCC Second Report and Order, ¶ 17.

[59] FCC Second Report and Order, Dissenting Statement of Commissioner Ajit Pai.

[60] FCC Second Report and Order ¶ 132.

capabilities for 911, the Access Board believes that the adoption of a text-to-911 requirement provides an important interim step in responding to the emergency access needs of people who are deaf, hard of hearing, or speech disabled."[61] The FCC seeks comment on the technical feasibility and costs of other solutions.[62] The FCC also indicates that it is not requiring providers to support SMS-based text to 911 indefinitely, as long as they provide customers with at least one text-to-911 option that works across the providers' entire network coverage area, and that providers may select any reliable method, including SMS or IP-based such as RTT, for text routing and delivery.[63] The Board believes that the RTT requirements it is proposing today will lay the foundation for accessible, reliable real-time IP communications for disabled and non-disabled users, in emergency as well as non-emergency situations.

4.4.10. ICT Hardware Accessibility

There are two additional areas of requirements set forth in the NPRM that could have potential cost implications for Federal agency ICT development and procurement.

The Access Board is proposing to require ICT hardware (e.g., computers, information kiosks, multifunction copy machines) to comply with several accessibility requirements established for ATMs and fare machines in Section 707 of the 2010 ADA Standards for Accessible Design relating to the following:

- Speech output.
- Braille instructions for initiating the speech mode.
- Display screen characters and visibility.
- Privacy of input and output.
- Key or ticket insertion.
- Function key contrast.

4.4.11. Online Product and Service User Support

The NPRM also includes proposed requirements for ICT support documentation and services; these are listed in Table A-4 of Appendix A. Federal agencies must currently ensure that the electronic content published or posted on Federal Government Web sites complies with the current Section 508 standards. However, the support sections of telecommunications manufacturer Web sites are not currently required to be accessible.

4.5. Scope of Proposed ICT Standards and Guidelines: What Entities Would Have to Comply?

Section 508 specifically applies to most Federal departments and agencies, as well as the USPS.[64] A limited number of exemptions (the Government Accountability Office, the Federal Election Commission, and Government-owned, contractor-operated facilities) from Section 508 requirements would be retained under the Access Board proposal. The proposed standards and

[61] FCC Second Report and Order ¶ 17 and fn. 54.
[62] FCC Second Report and Order ¶ 122.
[63] FCC Second Report and Order ¶ 44.
[64] 29 U.S.C. §794(d)(1)(A). We were not able to assess the specific impact of the rule standards and guidelines on the USPS in this preliminary analysis.

guidelines would also retain the present exemption for national security information, although it should be noted that this provision does not provide a blanket exemption for ICT developed or used by the U.S. Department of Defense (DOD), Homeland Security (DHS), and the national intelligence agencies.[65]

The rule requirements would apply to ICT procured from Federal contractors and vendors.[66] Some of these entities may already be producing products and services that are fully or partly compliant with the requirements in WCAG 2.0.

Many State and local governments, public university systems, health care and social service organizations, and other entities that receive Federal funding have ICT accessibility policies that are either based on the Section 508 standards or reference them in their entirety. These policies are diverse in content and implementation, so it is difficult to assess the "downstream" impact of the proposed ICT standards and guidelines on these entities.[67]

U.S. and foreign telecommunications equipment manufacturers whose products are sold in the U.S. market would continue to be covered by the Section 255 guidelines under the proposed rule.

4.6. Request for Comment on Specific Aspects of the Proposed 508 Standards and 255 Guidelines

1. To what extent would software developer guidelines such as the following comply with WCAG 2.0 Level A and Level AA?
   i. Microsoft software accessibility guidelines.
   ii. IBM software checklist.
   iii. Adobe Acrobat software.
2. To what extent do electronic content creation programs comply with the current W3C Authoring Tool Accessibility Guidelines?
3. Would the types of content specified in the NPRM that would need to be WCAG 2.0 Level A and Level AA compliant expand or contract the scope of material that is currently required by Section 508 or agency directives to be made accessible?

[65] For example, ICT that is used to support the business and administrative functions of these agencies is covered under the current and proposed Section 508 standards.

[66] Federal contractor and vendor ICT that is incidental to a contract (e.g., a computer at the contractor's workplace or the vendor's main Web site) to be compliant with the proposed Section 508 standards.

[67] While Section 508 does not directly regulate private businesses, State or local governments, or any other non-Federal organizations, many State and local governments have, by their own law, held themselves to complying with Section 508 or similar requirements in whole or in part (see http://www.section508.gov/state-policy for more information). Other entities such as public university systems and health care provider organizations have chosen to use the Section 508 standards for their ICT development or procurement, even though they are not statutorily required to do so. Some of these entities have adopted the current standard in its entirety, while other entities have adopted some portions of the standard. We do not know at this point whether or how these entities would decide to adopt the proposed Section 508 standards. Therefore, we cannot estimate any costs that nonregulated parties would incur by voluntarily adopting the proposed standard.

4. To what extent would hardware such as the following comply with WCAG 2.0 Level A and Level AA?
    i. Dell/EVAS computers.
    ii. HP computers and printers.
    iii. Xerox copiers.
    iv. IBM peripherals.
5. Can touch-screen accessibility be provided exclusively through remote operation?
6. To what extent is the availability of already captioned and audio-described programming expected to increase as the CVAA video programming requirements take effect?
7. Can compliant captioning and audio description be generated using automated captioning applications?
8. What current hardware and software approaches successfully address the accessibility barriers faced by individuals with disabilities who want to be able to locate and operate the caption and audio description controls?

5. Benefits of the Proposed Rule

The proposed Section 508 standards are intended to expand and improve access to ICT functionality for Federal employees with disabilities and members of the public with disabilities who are seeking information or data from a Federal agency.[68] Both of these groups of people are afforded additional protections under other parts of the Rehabilitation Act of 1973. Section 501 requires accommodations for disabled Federal employees. Section 504 requires any program or activity receiving Federal financial assistance to ensure that individuals with disabilities are able to participate. Section 508 requirements act in part to ensure that these guarantees of access extend to electronic information and ICT functionality.

The proposed Section 255 guidelines are intended to expand and improve the accessibility of telecommunications equipment to people with hearing, vision, and fine motor skill disabilities.

5.1. Types of Addressable Disabilities and Number of Potential Beneficiaries

The functional performance criteria proposed in Section 302 of the NPRM identify eight types of physical disabilities and limitations that can be potentially addressed by ICT accessibility standards and guidelines:[69]

- Without vision (about 2 million people had severe difficulty seeing in 2010).
- With limited vision (about 6 million people had non-severe vision difficulties).
- Without perception of color (not asked on the 2010 SIPP).

[68] Access to "information or data" is interpreted to include the ability to use applications and forms hosted on the Web, network servers, client computers, and other devices.

[69] Survey of Income and Program Participation (SIPP) estimates of the number of people with each type of disability in 2010 are shown in parentheses.

- Without hearing (about 1 million people had severe difficulty hearing).
- With limited hearing (about 6.5 million people had non-severe hearing difficulties).
- Without speech (about 2.8 million people had difficulty with speech).
- With limited manipulation (about 6.7 million people had difficulty grasping).
- With limited reach or strength (about 3.6 million people used a wheelchair).

Different provisions and combinations of provisions in the proposed requirements would improve ICT accessibility for Federal employees and other people with various disabilities and combinations of disabilities:

- Section 4.2 of this evaluation identifies 16 WCAG 2.0 standards that do not have close analogues in the current Section 508 standards. Compliance with most of these would improve the ability of screen readers to parse and interpret Web content, forms, and applications; software and hardware user interfaces; and telecommunications equipment displays for users without vision. The requirements relating to reliance on sensory characteristics (1.3.3), contrast (1.4.3), resizing of text (1.4.4), and providing multiple ways to find content (2.4.5) would also provide benefits to people with limited vision and those without perception of color.
- RTT capability is particularly important for people who are deaf, while the technical standards proposed as Section 410.2 through Section 410.5 (volume gain, magnetic coupling, interference, and ITU-T encoding) would benefit people who use AT to address hearing limitations.
- The proposed Section 407 requirements relating to operable parts (e.g., the 407.4 key repeat and 407.9 operability requirements) would ensure the accessibility of ICT hardware and telecommunications equipment for people with motor skill limitations, as would the platform accessibility standards in proposed Section 502.4.
- Users of telecommunications equipment with vision, hearing, speech, or fine motor skill disabilities would benefit from increased availability of accessible telecommunications products and improved accessibility of product documentation and support services.

A more extensive mapping of the provisions in the proposed rule that would benefit people with specific types of disabilities is provided in Table A-5 in Appendix A.

Some Federal employees and citizens who do not have addressable disabilities would also benefit from more consistent implementation of the portions of the proposed ICT standards that require adherence to Web best practices, such as ensuring consistent navigation and allowing for user modification of display parameters. For example, the proposed Section 411 requirements for caption processing technologies would support the availability and display of captioning used by people without disabilities in noisy environments and those for whom English is not their native language.

Other groups of people without disabilities (under the Census estimate definitions) who would potentially benefit may include people whose vision is corrected by using eyeglasses or contact lenses, people whose hearing is corrected by wearing hearing aids, and people with cognitive issues or learning disabilities:

- Implementation of the WCAG 2.0 text resizing and color contrast provisions referenced above may improve the ability of Federal employees and other people whose vision limitations are corrected with eyeglasses or contacts to see material on Web sites, software and hardware user interfaces, and telecommunications displays clearly. This could improve the level of comprehension of the instructions and content being displayed, which would reduce the time required to locate and understand the relevant material and the number of input errors and omissions on Web and non-Web forms and applications.[70]
- More universal adoption of the technical standards for ICT with two-way voice communication referenced above would improve the ability of Federal employees and other people who are able to address hearing limitations with the use of a hearing aid. Improvements in the volume and clarity of voice communications and speech output from machines would increase comprehension, reduce requests for repetition, and decrease the potential for mishearing and misunderstanding of voice communications and speech output.[71]
- More consistent implementation of the WCAG 2.0 standards referenced above relating to Web site and user interface navigation, consistency of menus and links, and multiple ways of providing content would increase the ability of people with cognitive issues and learning disabilities to locate and access Web content, forms, and applications on Federal Government Web sites. In addition, adoption of the WCAG 2.0 Level AA standards for error suggestion and prevention may increase the ability of people with these disabilities to complete and submit Web-based forms and applications.[72]

In addition, State and local governments, international organizations, and U.S. and foreign private-sector entities may benefit from more broad-based adoption of WCAG 2.0-based standards for Web-related and non-Web-related forms of ICT.

5.2. Benefits for Federal Employees With Disabilities

Federal Government employees who have addressable disabilities would benefit from updated ICT accessibility standards that allow them to be more productive and capable employees. As discussed in the previous section, the extent to which specific Federal employees could benefit from the proposed Section 508 standards would depend on the nature of their jobs and the type and severity of their disabilities, as well as on the extent to which the proposed Section 508 standards improve the accessibility of various forms of ICT, relative to the level achieved by the current requirements. In general, however, Federal employees with specific types of disabilities could be expected to benefit from adoption of the provisions in the proposed requirements referenced in Section 5.1 above for people with the same types of disabilities.[73]

[70] The 2010 SIPP did not collect information on the number of people with vision limitations corrected by eyeglasses or contact lenses.
[71] There were also about 3.4 million people in 2010 with no hearing difficulty only with use of a hearing aid.
[72] There were about 3.9 million people in 2010 with a learning disability; 2.4 with Alzheimer's disease, senility, or dementia; and 1.2 million with an intellectual disability.
[73] For example, a programmer without vision or with limited vision would benefit substantially from applying the WCAG 2.0 Level A and Level AA requirements to software, but this would provide no benefit to a program

We were not able to identify research studies that could be used to isolate the overall impact of ICT on Federal employee productivity or any that systematically relate specific ICT accessibility improvements to the productivity of Federal or private employees with various types of addressable disabilities. In the absence of such data, the *average* benefit per Federal employee with an addressable disability was estimated as follows:

- An hourly wage rate was estimated from the average annual Federal salary reported in September 2012 OPM data.[74]
- The hourly wage was adjusted to take into account the cost of leave. The average FTE employee was assumed to spend 1,760 hours at work annually after taking into account holidays, annual leave, and sick leave. For this analysis, we assumed that Federal employees take an average of 4 weeks of paid annual leave and 2 weeks of sick leave per employee per year, in addition to 10 paid Federal holidays.[75]
- The leave-adjusted wage rate was increased by 30 percent to account for benefits that include health insurance, life insurance, retirement, disability, and workers' compensation, based on FY 2005 OPM data on Federal employee benefit costs.[76]
- Updated ICT accessibility standards were assumed to improve the productivity of an average employee with addressable disabilities other than vision difficulties by 1 percent, or 17.6 hours per year spent at work. The productivity improvement for people with vision disabilities resulting from the proposed standards was assumed to be twice as large. The magnitude of productivity improvement experienced by a specific person will depend on the employee's occupation, type of disability, and adequacy of current accommodations provided by the agency to comply with its Section 501 obligations.[77]
- The assumed annual productivity improvement was multiplied by the leave-adjusted wage rate to determine the monetized value of the benefit from the rule increasing the productivity of Federal employees with an addressable disability.

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manager with difficulty hearing. Similarly, the proposed section 407.9 provision for operable controls would improve access to computers, copiers, and kiosks for people with limited strength and manual dexterity, but this requirement may not improve accessibility for someone in a wheelchair.

[74] OPM, Common Characteristics of the Government, March 2013.

[75] OPM, Work Years and Personnel Costs, FY 2005, October 2008 (last report available).

[76] Ibid.

[77] We were not able to locate data on the extent of productivity improvements that could be anticipated specifically as a result of switching from ICT that is compliant with the current Section 508 standards to ICT that complies with the applicable WCAG 2.0 Success Criteria and Conformance Requirements, as well as the additional requirements in the proposed rule, for workers with various types of disabilities. However, general support for an estimate of this magnitude is provided in a recent European study, which looked at three scenarios concerning the effect of improved Web access on LSHPD (long-standing health problem or disability) to non-LSHPD wage differentials. Scenario 1 had half of the wage differential eliminated, Scenario 2 had 10 percentage points of the wage differential eliminated, and Scenario 3 had the entire wage differential eliminated. Taking the average of the values reported on Table 49 gives an LSHPD to non-LSHPD wage ratio pf 84.7 percent. Subtracting that value from 1 gives a wage differential of 15.3 percent. Therefore, the lower range of wage increase is 9.1 percent (92.3 percent/84.7 percent – 1), the midrange is 11.8 percent (94.7 percent/84.7 percent – 1), and the upper range is 18.1 percent (100.0 percent/84.7 percent – 1). If the proposed rule improves Web access by 10 percent, the midrange estimate becomes 1.2 percent. See Technosite, "Study on Economic Assessment for Improving eAccessibility Services and Products," SMART 2009-0072, 2012.

Table 1 presents a preliminary estimate of the potential increase in Federal employee productivity from improved ICT accessibility that was developed using this approach.

Table 1: Value of Increased Federal Employee Productivity, 2012

Estimate Component	Value
Average Federal employee salary*	$78,467
Number of hours in FTE year	2,080
Average hourly wage for Federal employee	$37.72
Average number of working hours**	1,760
Leave-adjustment multiplier	1.18
Hourly wage adjusted for leave	$44.58
Benefit multiplier***	1.30
Fully loaded cost per employee hour of work	**$57.96**
Average number of working hours	1,760
Assumed percent increase in productivity for an employee with a non-vision disability	1%
Hour-equivalent of increased productivity for an employee with a non-vision disability	17.6
Value of annual increased productivity per employee with a non-vision disability	**$1,020**
Assumed percent increase in productivity for an employee with a vision disability	2%
Hour-equivalent of increased productivity for an employee with a vision disability	35.2
Value of annual increased productivity per employee with a vision disability	**$2,040**

*OPM, Common Characteristics of the Government: 2012, March 2013.
**Based on an FY 2005 average of 8 weeks of leave (4 annual, 2 holiday, and 2 sick).
***OPM, Work Years and Personnel Costs, FY 2005, October 2008.

The estimated value of increased productivity averages $1,020 for a Federal employee with non-vision disability. A Federal employee with a vision disability was estimated to experience an average annual productivity improvement of $2,040.

Estimates of the FY 2010 numbers of Federal employees with specific types of disabilities who could potentially be more productive with updated ICT accessibility standards are presented and discussed in Section B.3 of Appendix B. Table 2 presents estimates of total numbers of Federal employees with vision disabilities and other addressable disabilities.[78]

Table 2: Number of Federal Employees With Addressable Disabilities

Estimate Component	Vison Disabilities	Other Addressable Disabilities	All Addressable Disabilities
Civilian employees with addressable disabilities	9,486	26,795	36,281
Total Federal civilian workforce	2,108,639	2,108,639	2,108,639
Percentage of total civilian workforce	0.4%	1.3%	1.7%

Source: OPM, Federal Civilian Workforce Statistics for September 2010.

[78] It should be noted that the OPM statistics do not include employment data for the USPS and some other Federal entities, so employees with addressable disabilities who work for these entities are not included in these estimates.

The average per-person value of productivity improvements and estimated numbers of employees potentially benefitting from the proposed rule were multiplied together to calculate the total productivity benefits from increased Federal employee productivity. However, it is important to note that the full extent of these potential productivity benefits would not be realized immediately upon the proposed standards taking effect. For this preliminary analysis, we have assumed that one-half of the recurring annual accessibility improvement from the rule standards would be realized in the first year (2015) of the 10-year analysis period.[79]

Table 3: Estimated Benefits From Increased Federal Employee Productivity

Estimate Component	2015	2015–2024
Federal employees with vision disabilities	9,486	94,860
Value of annual increase in productivity per employee*	$1,020	$1,913
Federal employees with other addressable disabilities	26,795	267,950
Value of annual increase in productivity per employee**	$510	$956
Total productivity benefits	**$23,342,795**	**$443,513,100**
Present value of benefits in 2015 (millions)***		$327.5

*Assumed increases of $1,020 in 2015 and $2,040 thereafter.
**Assumed increases of $510 in 2015 and $1,020 thereafter.
***Present value of 2015–2024 benefits calculated using a discount rate of 7 percent.

Table 3 indicates that the proposed rule would increase the productivity of Federal employees with addressable disabilities by $23.3 million in 2015 and $443.5 million over the 10-year analysis period from 2015 through 2024, the first 10 years after the proposed standards have been assumed to take effect. This estimate may understate the true extent of productivity-related benefits for the following reasons:

- The estimates assume that there will be no growth in the number or inflation-adjusted salary of Federal employees with addressable disabilities during the next 10 years.
- This evaluation does not take into account any potential long-term benefits from Federal Government employees with addressable disabilities being able to develop more capabilities and experience as a result of improved ICT accessibility.
- This assessment also does not include potential benefits accruing from increased levels of skills and experience in the pool of workers who could be hired by Federal agencies in the future.
- Productivity benefits for Federal Government contractor and vendor employees were not estimated and included in this analysis.[80]

[79] All 2015–2024 dollar values shown in this table and throughout the preliminary RIA are in 2015 (i.e., inflation-adjusted) dollars.
[80] Data on the number of contractor employees and the incidence rate of various disabilities among the contractor workforce could not be located for this preliminary analysis. Some Federal contractors and vendors will be required to begin collecting these data under new Section 503 regulations published by the Department of Labor on September 24, 2013.

In addition, some State and local government employees with addressable disabilities may benefit indirectly from the proposed rule. For example, State and local government employees often need to work with Federal agency information and participate in or assist citizens with Federal Government-related electronic transactions. However, an estimate of these benefits was not developed for the preliminary regulatory evaluation.

Finally, it should be noted that some of the proposed ICT accessibility requirements could potentially reduce the productivity of Federal employees—both those with addressable disabilities and those who have no such disabilities—particularly in the first few years after the proposed standards would take effect. For example, applying the WCAG 2.0 standard to software may absorb developer time that would otherwise be used for other development and testing activities.

5.3. Benefits for Citizens and Other Residents With Disabilities

The Internet has become an important vehicle through which Americans who are online seek information or conduct transactions with Federal, State, and local government agencies. A 2010 Pew Internet and American Life study found that 82 percent of adult Internet users looked for information or completed a transaction on a government Web site—including both Federal and non-Federal Government Web sites—in the most recent 12 months. Table 4 summarizes the Pew survey findings on commonly cited reasons for visiting government Web sites.[81]

Table 4: Proportion of Adult Internet Users Visiting Government Web Sites

Reason for Visiting Government Web Site	Percentage of Adult Internet Users
Looked for information about a public policy or issue	48%
Looked up what services an agency provides	46%
Downloaded government forms	41%
Researched official government documents or statistics	35%
Sought recreational or tourist information agency	30%
Sought advice or information about a health or safety issue	25%
Sought information about or applied for government benefits	23%
Sought information about how to apply for a government job	19%

Source: Pew Internet and American Life Project, April 27, 2010.

Use of government Web sites allows citizens and other residents to obtain more information and perform transactions more efficiently with substantial time savings, relative to conducting these activities in person or over the phone.[82] Increased Web accessibility provides several opportunities for time savings to a person with an addressable disability by:

[81] Aaron Smith, "Government Online: The Internet Gives Citizens New Paths to Government Services and Information," Pew Internet and American Life Project, April 27, 2010. Note that this survey did not specifically ask participants to distinguish between visits to Federal Government Web sites and those to State and local government Web sites. However, it is reasonable to expect that most people visiting government Web sites for most, if not all, of the reasons shown in Table 4 would make at least some visits for those reasons to Federal Government Web sites.

[82] Federal Web analytic data underscore the growing importance of Federal Web sites as a public resource for obtaining documentary and multimedia-based information. According to data from the General Service

- Reducing the amount of time required to complete tasks already conducted online.
- Increasing the efficiency of obtaining information and completing transactions that would otherwise require in-person, mail, or telephone contacts.
- Reducing the amount of time lost to errors and omissions in completing applications, forms, and requests—both by reducing transcription and processing errors and by providing immediate feedback to the user on problems with the submission.
- Eliminating the need to store and retrieve paper copies of communications, documents, letters, and receipts.

The magnitude of time savings from improved accessibility of Federal Government Web sites for people with addressable disabilities depends on the following:

- The type and severity of disability or combination of disabilities.
- The frequency in which people with disabilities visit Federal Web sites and the duration and purpose of their visits.
- The extent to which bringing these sites into compliance with the proposed standards would reduce the amount of time to achieve their purpose for visiting a Federal Web site.

5.3.1. Benefits for People With Vision Disabilities From Use of More Accessible Web Sites

While persons with all types of addressable disabilities are expected to experience significant benefits from improved accessibility of Federal Web sites, this preliminary regulatory assessment formally estimates time savings and monetizes benefits from such improvements only for persons with vision disabilities. The methodology used to estimate time savings and monetize benefits for such individuals are described below. Benefits to persons with other types of addressable disabilities are discussed from a quantitative and qualitative perspective in the next subsection.

Based on third-party (commercial) and Federal data sources, Federal Web site usage may be estimated. While no data appear to be available on the Web habits of persons with disabilities specifically, it may be reasonably assumed that, when persons with disabilities go online, the number of Web sites visited and duration of their visits approximates that of the American public generally. For this preliminary assessment, an online adult with a vision disability was assumed to visit Federal Government Web sites an average of 15 times annually.[83] The average duration

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Administration Data Analytics Program (GSA DAP), 346.5 million documents were downloaded from Federal Web sites in 2014. Most of these downloaded documents (83 percent) were PDFs. (The Access Board received approval from OMB for citation and use of otherwise confidential GSA DAP Government-wide data in this regulatory assessment.) This volume of document downloads is important because many PDF-based forms and other documents are not currently accessible. The proposed Section 508 standards (E205.4) are designed to address this problem by requiring all PDFs posted on agencies' public-facing Web sites to be compliant with the international consensus standard for accessibility of document management applications (PDF/UA-1). Monetized benefits in this analysis do not include the incremental value of accessible documents posted on or downloadable from Federal Web sites to persons with addressable disabilities.

[83] This estimate was derived from Web analytic data maintained by GSA DAP and Census data. Specifically, the average number of annual visits per person to Federal Web sites was calculated by dividing the total number of sessions on Federal Government Web sites in calendar year 2014 (3.95 billion) as tracked by GSA DAP by the most

of a visit was assumed to be 4 minutes. This 4-minute visit duration figure represents a midrange estimate between several commercial and Federal data sources.[84]

A 2007 study that used a non-randomized sample of Internet users who are blind concluded that 30 percent of the time spent online is lost to accessibility problems with current Web sites.[85] However, the 2012 DOJ study indicates that most elements of the majority of Federal Government Web sites are compliant with the current Section 508 standards.[86] This means that the extent of improvement in accessibility that can be expected from the proposed rule is less than what would be anticipated from making a previously noncompliant site fully accessible. For this preliminary assessment, the extent of improvement—measured in the form of the time savings for site visitors who use a screen reader—was assumed to be 20 percent of what would be realized for making a completely noncompliant Web site fully accessible.[87]

Table 5 shows how these data and assumptions are used to calculate the amount of time saved from Web site accessibility improvement for an adult Internet user with a vision disability.

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recent Census Bureau statistics on the adult U.S. population (18 years and older) from the 2013 American Community Survey 1-Year Estimate (i.e., 242.5 million). It should be noted that the GSA DAP analytic data track visits to many—but not nearly all—Federal Web sites. Accordingly, since GSA DAP data does not reflect the total number of visits to all Federal Web sites (nor all actions or events by users on such sites), the estimated per-person annual number of visits to (and events on) Federal Web sites used in this analysis should be viewed as conservative.

[84] Three data sources were used to estimate the average time spent per visit on Federal Web sites. First, according to Web traffic statistics maintained by Nielsen NV, visitors to the eight most-visited Federal Web sites spent a total of about 34 minutes per person on these sites for the month of February 2014, and about 4.2 minutes per visit on the most-visited site (ww.irs.gov). See Clicks and Balances: Top Government Websites and U.S. Brands in February 2014. Second, according to GSA DAP data, the average session length per visit to Federal Web sites in 2014 was 3.7 minutes. Third, we calculated the weighted average (based on agency size) of the duration of visits to a sample of Federal Web sites for the period from July 2014 to January 2015 using Web analytic data from Alexa Internet, Inc. (www.alexa.com). This calculation yielded an average of 4.1 minutes per visit to Federal Web sites.

[85] Jonathan Lazar et al., "What Frustrates Screen Reader Users on the Web: A Study of 100 Blind Users," *International Journal of Human-Computer Interaction*, 22(3), pp. 247–269, 2007. Other empirical studies have reached similar results. See Disability Rights Commission, "The Web: Access and Inclusion for Disabled People," 2004, which found that the incremental difference in task completion times on high and low accessibility Web sites was 3.7 times higher for blind Web users than for non-disabled Web users (hereinafter, "Web Access and Inclusion"). Melody Ivory et al., "Search Results Exploration: A Preliminary Study of Blind and Sighted Users' Decision Making and Performance," *ACM CHI 2004 – Late Breaking Results Paper*, April 2004, reports the results from a study of 16 sighted and blind users conducting nine "factoid" Internet search tasks in a computer lab. The study found that blind users took about three times as long as non-disabled participants to look for information on Web pages with low accessibility. Nielsen Norman Group, "Usability Guidelines for Accessible Web Design," 2001, presents results from a study of 60 Internet users, which found that Web tasks were about three times easier for a control group of non-disabled users than for users who were blind or had low vision.

[86] Reported compliance rates for current Section 508 standards applicable to Web site home pages, forms, and applications averaged about 80 percent in the DOJ survey. The assumed 20 percent improvement in accessibility is consistent with an average compliance rate of 96 percent under the proposed rule. In addition, the DOJ survey results may overstate the extent to which some elements of agency Web sites are fully compliant with the current Section 508 standards. More information is available in Appendix D.

[87] The extent of time savings, relative to the use of Web sites that comply with the current Section 508 standards, will vary greatly depending on the Web sites visited, the tasks performed, and the type and severity of the site visitor's disability. People with vision or fine motor skill-related disabilities using Web sites with online forms or applications can be expected to realize the largest per-person benefits from implementing the proposed standards.

Table 5: Average Amount of Time Saved Per Person With Vision Disabilities From Increased Web Accessibility

Estimate Component	Value
Average number of visits to Federal Government Web sites annually	15
Average minutes spent per Federal Government Web site visit	4
Time spent on Federal Government Web sites annually (hours)	1.0
Percent of time lost on inaccessible Web sites*	30%
Estimated percent improvement in accessibility from proposed 508 standards	20%
Percent of total time on Federal Government Web sites saved from accessibility improvement	6%
Hours saved per person from accessibility improvement	**0.06**

*Estimate from Lazar et al., IJHCI, 2007.

Estimating the numbers of people with vision disabilities who would benefit from more accessible Federal Government Web sites required several sets of calculations:[88]

- *Age and disability status*: The numbers of people in 2010 with vision disabilities were obtained from the U.S. Census SIPP. Separate estimates were used for people age 15 to 64 and those age 65 and over.
- *Population growth*: According to the U.S. Census, the number of people age 15 to 64 is projected to increase by 0.5 percent annually from 2010 through 2024, while the population of people age 65 and over is expected to increase by 3.4 percent annually.[89] We assumed that the numbers of people in each age group with vision disabilities would increase at the same rate as the general population in the same age group.
- *Internet user population*: The 2010 SIPP provides estimates of the numbers of adults in each age group with and without disabilities who use the Internet. According to the SIPP, about 65 percent of adults age 15 to 64 and 31 percent of people age 65 and over were online in 2010. The Internet access rates for people with disabilities were 20 percent lower for those age 15 to 64 and 30 percent lower for those age 65 and over.
- *Internet user population growth rates*: The proportion of people with disabilities who are online was assumed to increase online by 1 percentage point annually (starting from 2010) for adults age 15 to 64 and 2 percentage points annually for people age 65 and over.
- *Federal Government Web site visitors*: Based on the 2010 Pew study, we assumed that 82 percent of adults with disabilities who are online visit at least some Federal Government Web sites. This rate is assumed to be constant from 2015 to 2024.[90]

[88] The data used to develop these estimates are presented and discussed in sections B.1 and B.2 of Appendix B.

[89] Estimate derived from Census Bureau, 2012 National Population Projections, "Table 2: Projections of the Population by Selected Age Groups and Sex for the United States: 2015 to 2060." The same rates of growth were applied to the 2010 estimates to obtain the 2015 populations for each of these age groups.

[90] The Pew survey asked participants about visiting a "local, State, or Federal Government Web site." The survey did not ask respondents to report visits to the Web sites of different levels of government. This analysis assumes that people who use the Internet to visit Federal, State, and local government Web sites make at least some of these visits to Federal Government Web sites annually. Thus, the Pew study estimate of the proportion of adult Internet users

- *Time saved from increased accessibility*: The time savings per person estimated in Table 5 were multiplied by the numbers of people in each age group with vision disabilities online who visit Federal Government Web sites to estimate the total hours saved from improved accessibility of Federal Government Web sites.

Table 6 presents estimates of the numbers of people with vision disabilities who are online and visit Federal Government Web sites, based on the data sources presented in Appendix B, Sections 1 and 2, and the aggregate amount of time saved from improved Federal Government Web site accessibility.

Table 6: Number of People With Vision Disabilities Who Would Benefit From Improved Government Web Site Accessibility and Amount of Time Saved

Estimate Component	2015	2015–2024
People with vision disabilities who visit Federal Government Web sites, age 15–64	2,069,500	22,812,622
People with vision disabilities who visit Federal Government Web sites, age 65 and over	1,150,468	17,184,722
Average annual hours saved from accessibility improvement*	0.03	0.06
Total hours saved by people with vision disabilities who visit Federal Government Web sites	**96,599**	**2,303,242**

*Assumed savings of 0.03 hours in 2015 and 0.06 hours thereafter for people with vision disabilities.

According to these estimates, there will be about 3.2 million people in 2015 with vision disabilities who visit Federal Government Web sites. As noted above, the number of potential beneficiaries is expected to grow in future years as the U.S. population of people with disabilities grows and a larger percentage of these individuals use the Internet. In addition, though not evaluated in this analysis, improved Web site accessibility may also increase the following:

- The proportion of online adults with addressable disabilities who visit government Web sites.
- The number of visits and amount of productive time spent on these Web sites.
- The efficiency of the current amount of time spent online, measured in terms of the volume of information obtained and transactions completed successfully in a given amount of time.

The aggregate value of benefits from improved Federal Government Web site accessibility was estimated by multiplying the total hours of time saved and the monetary value attributed to each

who visit Federal, State, and local government Web sites somewhat overstates the percentage of adult Internet users who visit Federal Government Web sites. However, there are no data available to adjust these estimates to exclude people who only visit State or local government Web sites. Conversely, the 2010 SIPP provides estimates of online access rates for adults with various types of disabilities that are lower than the access rates reported in other surveys, including the Pew survey. The estimated percentage of adults with disabilities who visit Federal Government Web sites is calculated as the product of these two numbers (see additional discussion in Section B.2 of Appendix B).

hour of time saved.[91] The aggregate time savings were valued at $10 per hour, the monetary value used in the 2010 DOJ regulatory assessment of the revised ADA standards for accessible design.[92]

Table 7 presents the calculations of the monetized value of the time savings from improved government Web site accessibility.[93]

Table 7: Monetized Benefits of Improved Government Web Site Accessibility

Estimate Component	2015	2015–2024
Total hours saved by people with vision disabilities	96,599	2,303,242
Value of time saved per hour	$10	$10
Total value of time saved	**$965,990**	**$23,032,416**
Present value of benefits in 2015 (millions)*		$16.61

*Present value of 2015–2024 benefits calculated using a discount rate of 7 percent.

Table 7 shows that the estimated value of time savings from improved accessibility of Federal Government Web sites is about $1.0 million in 2015 and $ 23.0 million over the 10-year analysis period from 2015 through 2024.

As noted above, there are potentially larger time savings for people with vision disabilities (as well as other addressable disabilities) from being able to obtain information and complete transactions online on accessible government Web sites that would have otherwise required in-person visits or other forms of contact. However, we were not able to locate adequate data that could be used to quantify these savings.

[91] It should be noted that this aggregate value of time saved by persons with disabilities does not include time savings from persons who formerly visited agency field or headquarter offices to transact business, but, due to improve accessibility of federal Web sites, would instead conduct their business online. Depending on the agency and type of transaction at issue, this time savings could potentially be quite substantial. For example, Social Security field offices averaged about 118,500 visitors per day in 2013, with average wait times of 30.5 minutes. See Office of the Inspector General, Social Security Administration, Audit Report: The Social Security Administration's Reduction in Field Office Operating Hours, 2, 6 (August 2014).

[92] This $10 value per hour assumption should be considered conservative in several respects. First, the average hourly "base" wage for all workers on which the DOJ assumption was based is now 5 years old. See HDR|HLB Decision Economics, "Final Regulatory Impact Analysis of the Final Revised Regulations Implementing Titles II and III of the ADA," July 23, 2010 (2010 DOJ ADA Final RIA). Second, and perhaps more importantly, the 2010 DOJ ADA Final RIA developed this $10 per hour time valuation figure based on an estimated 50-percent pay gap between workers with and without disabilities. Other sources, however, suggest this wage gap estimate may be too high. For example, a 2013 study by the Cornell School of Industrial Relations found a wage gap of only 9.3 percent for full-time male workers with disabilities, and a compensation gap of 6.7 percent. See Cornell University, Employment and Disability Institute, Research Brief: Total Compensation Gaps are Distinct from Wage Gaps, 3-4 (2013). Using either of these figures to monetize the value of time saved by persons with addressable disabilities would also necessarily increase monetized benefits for improved accessibility of Federal Web sites.

[93] As in the Federal employee benefits analysis, one-half of the accessibility improvements resulting from the proposed standards are assumed to be made in each of the first 2 years (2015 and 2016) of the 10-year analysis period.

5.3.2. Benefits for People With Other (Non-Vision) Addressable Disabilities From More Accessible Websites

People with other types of addressable disabilities (i.e., non-vision disabilities) would also be expected to accrue substantial benefits from improved accessibility of Federal Web sites brought about by the proposed rule. For example, expected benefits from improved Federal Web site accessibility would be experienced by people with hearing impairments or disabilities relating to manual dexterity or upper-body mobility:

- With Web sites incorporating a growing body of video, Flash, and other audio-based elements, sound is becoming an increasingly important aspect of Web content and function. For people who are deaf or have severe hearing impairments, multimedia (video) content is useless without captions. However, many video and audio files posted on Federal Web sites are uncaptioned, rendering such content inaccessible. The proposed Section 508 standards would more clearly require Federal agencies to caption multimedia files through incorporation of WCAG 2.0's Success Criteria 1.2.3.

  Federal Government-wide Web analytic data (GSA DAP) show that millions of videos on Federal Web sites are watched annually. Given the volume of videos currently posted on Federal Web sites, the benefits of captioned videos (or transcribed audio content) to persons with hearing disabilities would likely be profound. Collectively, in 2014, GSA DAP data show that there were 8.37 million unique video plays on Federal Web sites, with an average session duration of 9.5 minutes.[94] People with hearing impairments would be better able to learn about Federal programs or services, get instruction on completion of Federal forms, engage in civic discourse by watching speeches of Federal officials, explore topics in American history, or become more informed on health issues.

- People with significant reach, dexterity, or mobility impairments—which may include, for example, persons with cerebral palsy, paralysis, muscular dystrophy, or traumatic brain injuries—often use alternate input devices such as head wands, trackballs, sip and puff switches, eye-tracking devices, or voice recognition systems. For them, some of the most commonly identified accessibility issues on Federal Web sites—including missing or poorly designed navigational links, inaccessible form fields, or menus that require using a mouse—can make it impossible to navigate between Web pages or to fill out forms.[95] The proposed Section 508 standards, through incorporation of WCAG 2.0 (including new Success Criteria 2.1.2, 2.4.3, 2.4.4, 2.4.6, 3.3.3, and 3.3.4) and PDF/UA-1, would ensure greater navigability, functionality, and usability of Federal Web sites and

[94] Currently, GSA DAP government-wide data log only video-based "events" at the discretion of the agency webmaster. Additionally, even when an agency elects to track video usage, only the playing of videos through a YouTube channel or JW Player can be detected. The Web analysis tools cannot detect videos viewed on a player embedded on a Web site, nor do they track video downloads. For these reasons, the number of video "events" logged by the GSA DAP data does not fully capture the total number of videos plays (or downloads) by users of Federal Web sites.

[95] For empirical studies on accessibility issues commonly found on Federal Web sites, see, for example, A. Olalere and Jonathan Lazar (2011), "Accessibility of U.S. Federal Government Home Pages: Section 508 Compliance and Site Accessibility Statements," *Government Information Quarterly 28*(3), 303–309; Paul T. Jaeger (2006), "Assessing Section 508 Compliance on Federal e-Government Websites: A Multi-Centered, User-Centered Evaluation of Accessibility for Persons with Disabilities," *Government Information Quarterly* 23(2), 169–190; Eleanor T. Loiacono, Scott McCoy & William Chin (2005), "Freedom of Access: A Study of Federal Website Accessibility for Those with Disabilities," *IT Professional*, 7(1), 27–31.

> forms for persons with dexterity and mobility disabilities. Design features targeted to Web site users who are blind would also likely benefit users with dexterity or motor impairments because making Web content accessible through keyboard input (or other alternative input device), as opposed to a mouse, is needed by both groups.[96]

The number of persons with other addressable disabilities expected to use and benefit from improved access to Federal Web sites can be estimated from the data presented in Appendix B. An estimated 5.2 million people age 15 to 64 and 3.4 million people age 65 and over with non-vision addressable disabilities would be expected to benefit in 2015.[97]

Based on empirical research on Web site accessibility barriers, it is also possible—using this estimated beneficiary population—to develop a potential time-savings scenario on which to base an approximation of monetized benefits for persons with other addressable disabilities who would likely benefit from improved accessibility of Federal Web sites. In a 2004 study, the British Disability Rights Commission conducted a formal investigation of accessibility barriers faced by Web users with different types of disabilities (e.g., vision, hearing, dexterity/motor, and dyslexia). One part of this study involved a 50-person user panel consisting of individuals with each type of studied disability. Panelists were each asked to perform two tasks on 10 different Web sites, for a total of 913 completed tasks on 100 governmental and non-governmental Web sites.[98] Researchers then assessed the comparative task success rates between impairment groups. Relative to persons who are blind (average success rate = 53 percent), persons with non-visual impairments (average success rate = 84 percent) had about one-third as much reduction in the rate of successfully completing the test tasks, relative to a baseline of a 100-percent success rate.[99]

In light of this study, an estimate of time savings could be made by assuming that relative task success rates between users who are blind and users with other addressable disabilities may be equated with time savings. Assuming that task success rates are directly proportional to time savings, people with other addressable disabilities would be expected to experience one-third of the time loss (i.e., 10 percent) from inaccessible Web sites as people with vision disabilities.

People with other addressable disabilities would, under this approach, save an estimated 86,269 hours in 2015 from improved accessibility of Federal Web sites, and a total of 2.08 million hours over the 10-year time horizon of the proposed rule. Applying the methodology used to calculate monetized benefits for persons with vision disabilities, the estimated value of these time savings from improved Federal Web site accessibility would be about $863,000 in 2015 and $20.8 million over the 10-year analysis period.

[96] Jonathan Lazar & Paul Jaeger (2011), "Reducing Barriers to Online Access for People with Disabilities," *Issues in Science and Technology* 17(2), p. 75.
[97] See also discussion in Appendix B-2.
[98] Disability Rights Commission, Web Access and Inclusion, pp. 24–25.
[99] Ibid. at p. 25 and Table 1.

Data and other information on the following issues are specifically requested in comments from the public:

- The extent to which people with vision and other addressable disabilities currently use or can be expected to use government Web sites.
- The magnitude of time savings and improved success rates by vision and other addressable disabilities in completing searches and transactions that could be expected to result from adopting the proposed standards.
- Estimation of benefits from improved accessibility of other forms of ICT covered under the Section 508 standards.

5.4. Benefits for Federal Agencies

Federal agencies may also realize some long-term cost savings associated with implementing the proposed standards and guidelines. Web sites could be more readily maintained and updated if the programming practices required to ensure Web site accessibility were consistently implemented and followed, although the associated benefits are more difficult to quantify. For example, the W3C WAI site notes that adopting WCAG 2.0 also offers many potential benefits to firms that provide Web-based content, forms, and applications:[100]

> Incorporating accessibility usually increases site development time initially. However, in the long term Web accessibility can reduce the time an organization spends on site development and maintenance, as follows:
>
> - Reduced time and effort needed to change presentation across a site by defining presentation through a style sheet and using proper markup for structure.
> - More efficient debugging with automated validation tools by conforming to standards and identifying a DOCTYPE.
> - Reduced redesign and translation time and skills.

W3C also anticipates cost savings from reduced bandwidth use and server load, easier enabling of content on different configurations (e.g., mobile sites), and easier transition to the use of advanced Web technologies.

Federal agencies would also realize cost savings from reductions in the volumes of visits, mail correspondence, and phone calls from people with addressable disabilities. However, adequate data do not appear to be available on the current volumes of these transactions. For this preliminary assessment, we estimated specific benefits to Federal agencies from reduced call volumes as follows:

- While all adults with addressable disabilities may call government agencies, only those who are online could shift additional inquiries and requests to more accessible Web sites.

[100] W3C, WAI, "Developing a Web Accessibility Business Case for Your Organization," updated September 7, 2012.

- These individuals are assumed to make an average of two calls annually to Federal Government agencies, and 20 percent of these calls could be avoided by improvements in Web site accessibility.[101]
- Per-call cost savings to the Federal Government are estimated at $3.43, the amount estimated in the final regulatory analysis of the October 2013 DOT final rule relating to accessible airport kiosks and air carrier Web sites.[102]

Table 8 shows the calculation of these cost savings to Federal agencies from reduced call volumes.

Table 8: Estimated Benefits to Federal Agencies From Reduced Call Volumes

Estimate Component	2015	2015–2024
Adults with vision disabilities who visit Federal Government Web sites	3,219,968	39,997,345
Adults with other addressable disabilities who visit Federal Government Web sites	8,626,937	108,416,973
Assumed annual number of calls per person	2	2
Percentage reduction in calls from improved Web site accessibility*	10%	19%
Total reduction in calls	**2,369,381**	**56,996,346**
Cost savings per avoided call	$3.43	$3.43
Total savings from reduced call handling	**$8,126,977**	**$195,497,468**
Present value of benefits in 2015 (millions)**		$140.9

*Assumed reductions of 10 percent in 2015 and 20 percent thereafter. The average percent reduction over 2015 through 2024 is 19 percent.

Table 8 shows that reduced call volumes from improved ICT accessibility could be expected to save Federal agencies $8.1 million in 2015 and $195.5 million over the 10-year analysis period from 2015 through 2024. The estimated value of these cost savings would be 50 percent higher if the average person with an addressable disability who is online calls a Federal Government agency an average of three times annually. The estimated value of these cost savings would be 50 percent lower if the average person with an addressable disability who is online calls a Federal Government agency an average of once per year.

Additional savings would accrue from reduced staffing required to conduct in-person visits, review and reply to correspondence, and contact people who have submitted forms and applications with incomplete or incorrect information.

In addition, adopting the proposed ICT standards may result in improved agency compliance rates over time. OMB recently released a strategic plan for addressing current Section 508 compliance shortfalls, which were attributed to three primary factors: understanding and

[101] A sensitivity analysis was conducted to estimate benefits with higher (three per year) and lower (one per year) average annual numbers of calls.
[102] Econometrica, Inc., "Final Regulatory Analysis on the Final Rule on Accessible Kiosks and Web Sites," October 23, 2013.

applying standards, defining and measuring program success, and developing the workforce.[103] The proposed rule would help address all three of these identified deficiencies:

- The extensive resources available to support implementation of the WCAG 2.0 standards are universal—no individual agency or office policies would need to be developed to interpret the requirements, as is the case for the less concretely specified current Section 508 standards.
- The WCAG 2.0 Success Criteria are measurable and testable, making them less burdensome for agencies that would find it easier to develop performance metrics that are consistent across affected entities.
- Finally, employees with significant Section 508 compliance responsibilities would have increased access to external classroom, library, and online resources.

Data and other information about other areas of potential cost savings to Federal agencies are specifically requested in comments on the NPRM.

5.5. Benefits From Increased Availability of Accessible Telecommunications Products, Documentation, and Support Services

The current Section 255 guidelines provide benefits to telecommunications equipment users who have various types of disabilities. People who are deaf or hard of hearing are able to obtain and understand how to use equipment that supports TTY and TRS—typed text services using a communications assistant. These services are being increasingly supplanted by more capable or efficient alternatives to voice communications, including text messaging and Video Relay Services (VRS) for people using American Sign Language. RTT represents the next generation of these voice communication alternatives. People using RTT are able to have faster, more natural conversations than is possible using SMS. RTT allows the receiver to be able to see part of the message before it is completed, a capability that is particularly valuable in the context of some emergency calls.

According to the most recent SIPP, there are about 11 million adults who either have difficulty hearing or use a hearing aid. The Real Time Text Task Force expects that RTT:[104]

> … will be adopted by mainstream users as well. In particular, it is a natural extension for other real-time, conversational services such as voice telephony, e.g., for use in noisy environments, when you want to communicate during a meeting when voice is not appropriate. It is also very useful for conveying information where exact spelling is important during a voice call, e.g., booking numbers, street addresses, words that are hard to perceive because of different dialects, etc.

[103] OMB, "Strategic Plan for Improving Management of Section 508 of the Rehabilitation Act," January 24, 2013.
[104] Real Time Text Task Force, "What is Real Time Text?" viewed December 2013.

Adequate data and information that can be used to quantify the potential benefits of the proposed standards in this area were not provided in response to the Access Board's two ANPRMs, and we have not identified other sources for this information. The Access Board is seeking input from the public on the benefits associated with RTT in Section 5.8 below.

The proposed rule would also lead to improvements in the accessibility of electronic documentation and support services provided for telecommunications products. Users with various types of disabilities would be better able to evaluate, purchase, and make full use of products with the accessibility features they require or prefer to use.

Lastly, American companies that manufacture telecommunications equipment would likely derive significant benefits from harmonization of the Section 255 guidelines with consensus standards by helping to ensure return on investments in accessibility technology, remain competitive in the global marketplace, and achieve economies of scale created by wider use of nationally and internationally recognized technical standards.[105] Similar benefits would likely accrue more generally to all ICT-related products as a result of harmonization; however, given the relative lack of existing national and globally recognized standards for accessibility of mobile technologies, such benefits may be felt more keenly in the mobile technology marketplace.[106]

5.6. Benefits Accruing to Other Entities

State and local governments, international organizations, and private-sector entities may also benefit indirectly from more broad-based adoption of WCAG 2.0-based standards for Web-related and non-Web-related forms of ICT. These entities are not generally required to apply the Section 508 standards to ICT and electronic content they purchase, produce, or disseminate. However, many of these organizations have accessibility standards that are based on the current Federal Government standards.

The proposed Section 508 standards would provide a foundation for these entities to update or supplement their own accessibility standards, should they choose to do so. Irrespective of whether they decide to proceed with this update, these organizations may also benefit over time from Federal Government adoption of WCAG 2.0-based standards. Specific benefits could include the following:[107]

- Access to a larger pool of ICT developers and content creators who are trained and experienced in universal accessibility standards.
- Reference to a universal set of standards that expands the training and support resources available to employees and contractors.

[105] See, for example, TEITAC Report, Section 4.3 (discussing benefits of harmonization); Hearing on Convention on the Rights of Persons with Disabilities Before Senate Committee on Foreign Relations, 113th Cong. (November 2013) (statement of Frances W. West, Worldwide Director, Human Ability and Accessibility Center, IBM Corporation addressing benefits to domestic manufacturers, particularly related to mobile technologies).
[106] Ibid.
[107] These benefits are discussed in length in the W3C "Business Case" Guidance. They include expanded market share resulting from increased use, increased positive image, decreased personnel costs for maintaining the site, decreased cost of upgrading for new technologies, and decreased translation costs.

- Increased variety and capability of authoring tools used to produce accessible content.

5.7. Summary of Benefits

The value of the monetized benefits estimated in this assessment was calculated over a 10-year analysis period (assumed to be from 2015 through 2024) and converted into annualized values using 7-percent and 3-percent discount rates. These estimates are presented in Table 9.[108]

Table 9: Annualized Value of Monetized Benefits, 2015–2024 (Millions of 2015 Dollars)

Monetized Benefit Component	7-Percent Discount Rate	3-Percent Discount Rate
Benefits from increased Federal employee productivity	$46.6	$45.3
Benefits from improved Federal Government Web site accessibility to people with vision disabilities	$2.4	$2.3
Benefits to Federal agencies from reduced call volumes	$20.1	$19.8
Total quantified benefits	**$69.1**	**$67.5***

*Benefit numbers do not sum to total because of rounding.

The annualized value of monetized benefits expected to result from implementation of the proposed Section 508 standards during the 10-year analysis period is estimated at $ 69.1 million using a 7-percent discount rate and $ 67.5 million using a 3-percent discount rate.

[108] A table showing the estimated benefits in each year of the 10-year analysis period is provided in Appendix E.

Data were not available to develop monetized estimates for some categories of benefits. A list of some of these unquantified benefits is provided in Table 10.

Table 10: Unquantified Benefits of the Proposed Rule

Time savings by people with hearing, cognitive, speech, or manual dexterity or motor impairments from more accessible Federal Government Web sites.
Improved accessibility of electronic content (especially PDFs and videos) on Federal Web sites for persons with addressable disabilities.
Potential increase in employment of people with addressable disabilities.
Increased ability for people with addressable disabilities to obtain information and conduct transactions electronically.
Better civic engagement by persons with disabilities due to improved access to information and services on Federal Government Web sites.
Greater independence for persons with disabilities who can potentially access information on Federal Government Web sites themselves, rather than having to rely on others to access such information for them.
Increased ability for people without disabilities to access information and conduct businesses electronically even when they are limited by their situation, such as in a noisy or low-bandwidth environment or bright outdoors.
Agency cost savings from reduced levels of mail correspondence and in-person visits.
People who are deaf or hard of hearing to have faster and more natural conversations with RTT than is possible with current text-messaging functionality.
Improved ability of individuals with vision impairments and other disabilities to evaluate, purchase, and make full use of telecommunications products with the accessibility features they require or prefer to use because of increased accessibility of product documentation and support services.
Federal Government access to a larger pool of developers and content creators with required accessibility knowledge and skills because of harmonized standards.
Benefits to State and local governments, businesses, and nonprofit entities from harmonization of standards, including potential cost reductions to ICT manufacturers from being able to sell a single line of accessible products and services in public-sector, commercial, and international markets.
Intrinsic (existence) value that people with and without disabilities derive from the nondiscrimination and equity values served by Sections 508 and 255.

The estimates and analysis presented in this section indicate that the proposed rule would provide substantial benefits to Federal employees, other people with disabilities that are addressable by ICT accessibility standards, Federal Government agencies, and other entities that have adopted ICT accessibility requirements based on the current Section 508 standards.

5.8. Request for Comment on Specific Aspects of Benefits Estimates

1. Is any information available on the numbers or proportion of Federal contractor and vendor employees who have various types of addressable disabilities?
2. Is there any information or data available on the time savings or productivity increases accruing to people with vision and other addressable disabilities from using WCAG 2.0-compliant Web sites or non-Web ICT instead of Web sites and other ICT that is compliant with the current Section 508 standards?

3. Would any of the proposed requirements limit the productivity of Federal Government, contractor, or vendor employees who develop or evaluate software or create electronic documents or other electronic content?
4. How frequently and for what duration and purposes do people with vision and other addressable disabilities use Federal Government Web sites?
5. Do Federal agencies have any information or data on the cost savings that can be achieved by substituting electronic information requests and transactions for those handled by means of phone calls, mail, or office visits?
6. Are there any studies or research available that could be used to develop estimates of the benefits of RTT capability to people who are deaf or hard of hearing?
7. Would reliance on an SMS-based approach would leave certain needs unmet that would be addressed by RTT, and if so, what are the scope and nature of the additional benefits that would be gained by requiring ICT that supports real-time voice communication to also support RTT. In addition, are the benefits from RTT that have are particularly applicable in the context of emergency calls as significant in non-emergency situations?

6. Baseline Compliance Costs

Federal agencies incur costs to comply with the current Section 508 standards—both in the form of personnel costs for employees to develop, maintain, and use compliant ICT and to purchase compliant products and services from Federal contractors and vendors. Consequently, a major component of the work done for this preliminary assessment was to develop estimates of current levels of Section 508-related expenditures for various accessibility-related activities and compliance requirements.

Our starting point for estimating the "baseline costs" for Federal agencies is a compilation of data on Section 508 compliance activities and achievements collected in a recent DOJ survey.[109] The survey requested data in four areas: general processes for implementing Section 508, procurement, administrative complaints and civil actions, and Web site compliance. Selected results from the survey are presented in Appendix C.

Using the data from the DOJ survey and other data sources, we developed estimates for five specific categories of costs that Federal agencies currently incur to comply with the existing Section 508 standards:

- Developing and implementing Section 508 policy.
- Training Federal employees, including IT and procurement staff.
- Incorporating accessibility into software, Web sites, and audiovisual media.
- Creating and repairing electronic documents.
- Evaluating electronic content, products, and services for compliance.

[109] DOJ, "Section 508 Report to the President and Congress: Accessibility of Federal Electronic and Information Technology," September 2012.

These estimates are derived in Sections 6.1 through 6.3 and summarized in Section 6.4. The aggregate estimate was used in conjunction with data on Federal ICT budgets and procurement to develop an estimate of the current costs incurred by Federal contractors and vendors to make and sell Section 508-compliant ICT products, services, and content to the Federal Government (see Section 6.2). Finally, we reviewed available data to develop an estimate of the current annual costs for telecommunications manufacturers to produce accessible product documentation and support materials (see Section 6.3).

6.1. Federal Agency In-House Baseline Costs

6.1.1. Section 508 Policy Development and Implementation for Federal Agencies

All but the smallest agencies have Section 508 offices. Section 508 offices most frequently evaluate Web site accessibility, provide training, create or repair electronic documents, and assist acquisition officials to prepare Section 508 language in ICT contracts. However, these offices typically have relatively modest staffing and budget resources, as indicated in the 2012 DOJ report. Baseline cost estimates based on the DOJ survey data (see Appendix C) are presented in Table 11.[110]

Table 11: Annual Baseline Cost of Section 508 Policy Development and Implementation

Agency Size	Number of Employees	Number of Components*	Average Section 508 Office Budget
Very large	>25,000	178	$557,584
Large	10,000–25,000	68	$208,305
Medium	1,000–10,000	18	$76,000
Small	100–1,000	28	$13,698
Very small	<100	26	$0
All agencies		**318**	**$362,158**
Baseline policy cost			**$115,166,236**

*Agency components are typically separate administrations but can be branches, divisions, or offices.
Source: Econometrica calculations from 2012 DOJ Section 508 report.

Current costs for Section 508 offices are estimated at $115.2 million annually.

[110] Note that the average cost for all agencies ($362,158) is lower than the figure ($413,497) reported in the DOJ report. The DOJ estimate does not adjust for differences in the response rates for components in different agency size classes.

6.1.2. Training of Federal Employees

Various categories of Federal employees require training to be able to ensure that the Web pages and applications, software, electronic documents, and other electronic content they produce or disseminate comply with the current Section 508 requirements. A preliminary estimate of baseline Section 508 compliance training costs was developed using the following assumptions:

- According to the Federal employment data presented in Table D-3 of Appendix D, there were 81,639 Federal employees in information technology occupations in 2011. These employees were assumed to receive an average of 2 hours of training annually related to Section 508 compliance.[111]
- There were 41,874 Federal employees in contracting-related occupations in 2011. These employees were assumed to receive an average of 1 hour of training annually.
- There were 76,013 Federal employees in selected other occupations that are likely to have responsibilities for Section 508 compliance. These occupations include audiovisual production employees, writers and editors, visual information specialists, program managers, human resources managers, and EEO staff. These employees were assumed to receive an average of 1 hour of training annually.
- The direct expenses (or "out-of-pocket costs") of providing training vary significantly depending on whether employees receive in-person or online training. Classroom training provided by third-party instructors typically costs several hundred dollars per attendee.[112] On the other hand, the incremental direct cost of having an additional employee complete an online training course available on www.section508.gov is effectively zero. For the baseline cost estimate, direct training costs were assumed to average $100 per employee receiving training.
- In addition to the direct expenses incurred for in-person and online training, the costs of training include the value of the time employees spend in training. For the baseline cost estimate, the time employees spend in training was valued at the average hourly Federal wage rate for employees in that occupational category.
- Wage costs for employees receiving training were multiplied by a factor of 1.54 to account for benefits and other non-wage compensation.

Baseline cost estimates for Section 508 compliance training based on these data and assumptions are presented in Table 12.

[111] The average amounts of annual training are based on the results from the 2012 DOJ report. It should be noted that while some IT-related employees probably receive several hours of training annually, some employees in these occupational categories may not receive any training at all.

[112] This cost could be incurred either as a direct expense (in the case of contractor training) or as the value of trainer time (if a Federal employee provides the training).

Table 12: Annual Baseline Cost of Federal Employee Training

Estimate Component	Number
Number of employees requiring training	
IT	81,639
Contracting	41,874
Other selected occupations	76,013
Total number of employees	199,526
Direct expense per employee	$100
Direct expense of training (1)	**$19,952,600**
Average hourly wage	
IT	$44.69
Contracting	$38.95
Other selected occupations	$41.07
Value of trainee time	
IT (2 hours each)	$7,308,260
Contracting (1 hour each)	$1,631,165
Other selected occupations (1 hour each)	$3,120,422
Indirect cost of trainee time	$12,059,847
Multiplier to account for benefits	1.54
Loaded cost of trainee time (2)	**$18,625,315**
Baseline training cost (1) + (2)	**$38,577,915**

Direct training costs for Federal employees are estimated at $20.0 million annually, and the value of employee time spent receiving training is estimated at $18.6 million annually. Total baseline costs for Section 508 compliance training of Federal employees are estimated to be $38.6 million annually.

6.1.3. Development of Accessible Software, Web Sites, and Audiovisual Media

A preliminary estimate of recurring annual baseline costs associated with Federal agencies incorporating accessibility into software (including firmware, platforms, and applications) and Web sites, forms, and applications was developed using the following assumptions:

- Federal IT employees who develop applications or system software were assumed to devote time to ensuring that the software they develop is Section 508 compliant.[113]
- Of the Federal IT employees included in the "information security analysts, Web developers, and computer network architects" occupational group, half were assumed to devote time to developing Section 508-compliant Web sites, forms, and applications.[114]

[113] A detailed breakout of the number of Federal employees in specific IT occupations could not be located. The percentage of Federal IT employees who are software developers was assumed to be equal to the percentage in the private sector calculated using the Bureau of Labor Statistics (BLS) data in Table D-4.

[114] The percentage of Federal IT employees who are classified in this category was assumed to be equal to the percentage in the private sector calculated using the BLS data in Table D-4.

- All Federal audiovisual production employees were assumed to devote time to developing Section 508-compliant audiovisual media.
- The average Federal employee works 1,760 hours annually, net of holiday, annual, and sick leave.[115]
- An average of 5 percent of these employees' working time was assumed to be devoted to ensuring that the software, Web, and multimedia products they develop are Section 508 compliant.[116]
- Direct wage costs were multiplied by a factor of 1.54 to account for benefits and other non-wage compensation.

Baseline cost estimates based on these data and assumptions are presented in Table 13.

Table 13: Annual Baseline Cost of Software/Web/Audiovisual Media Accessibility Compliance

Estimate Component	Software Development	Web Development	Audiovisual Production	All Applications
Number of employees	22,980	3,380	1,184	27,544
FTE work hours per year*	40,444,821	5,948,717	2,083,840	48,477,378
Compliance hours per year**	**2,022,241**	**297,436**	**104,192**	**2,423,869**
Average annual salary	$92,080	$81,670	$82,890	$90,408
Direct cost per hour	$44.27	$39.26	$39.85	$43.47
Loaded cost per hour	$68.37	$60.64	$61.55	$67.13
Baseline development cost	**$138,260,058**	**$18,036,589**	**$6,412,613**	**$162,709,260**

*Based on average work hours of 1,760 annually.
**Assumed to be 5 percent of total employee work time.

Compliance costs for accessible software, Web, and multimedia developed by Federal employees are estimated at $162.7 million annually.

6.1.4. Evaluation of Software, Web, and Multimedia for Section 508 Compliance

Federal agency IT developers must spend a certain percentage of their time evaluating and testing the software, Web programming, and multimedia they design and produce. It is reasonable to assume that evaluation time can be estimated as a percentage of the time spent developing these forms of ICT.

Accordingly, baseline evaluation and testing costs were estimated using the following data and assumptions:

[115] OPM, "Federal Civilian Workforce Statistics: Work Years and Personnel Costs, FY 2005," October 2008 (most recent report available).

[116] This estimate is consistent with the estimated percentage of time that is reportedly required to build accessibility into newly developed Web sites. See, for example, "The Response to United States Department of Justice Advance Notice of Proposed Rulemaking (RIN 1190-AA61, Docket No. 110) Nondiscrimination on the Basis of Disability; Accessibility of Web Information and Services of State and Local Government Entities and Public Accommodations," comments submitted by Marco Maertens on behalf of Accessibility Associates, LLC, January 24, 2011. Mr. Maertens estimated that incorporating accessibility in the early stages of a Web site design project can be expected to add 3 to 6 percent to development time.

- Incorporating Section 508 compliance into these forms of ICT developed by Federal agencies was assumed to account for 5 percent of the total development hours estimated in Table 13.
- For this analysis, we assumed that the time required to determine whether applications and systems software; Web sites, forms, and applications; and audiovisual media meet applicable accessibility standards is equal to 25 percent of the development time devoted to Section 508 compliance for each of these types of ICT developed by Federal agencies.[117]

Baseline cost estimates developed using these data and assumptions are presented in Table 14.

Table 14: Annual Baseline Cost of Software/Web/Audiovisual Media Evaluation

Estimate Component	Software Evaluation	Web Evaluation	Audiovisual Evaluation	All Applications
Development hours per year for compliance activities	2,022,241	297,436	104,192	2,423,869
Additional hours for compliance testing and evaluation	25%	25%	25%	25%
Testing and evaluation hours per year	505,560	74,359	26,048	605,967
Loaded hourly wage rate	$68.37	$60.64	$61.55	$67.13
Baseline testing/evaluation cost	**$34,565,015**	**$4,509,147**	**$1,603,153**	**$40,677,315**

Compliance costs for evaluating and testing software, Web, and multimedia ICT developed by Federal employees are estimated at $40.7 million annually.

6.1.5. Creation and Repair of Electronic Documents and Other Electronic Content

This cost element is the most difficult to estimate, but it is also likely to account for the largest share of the total baseline cost for Federal agencies because achieving compliance requires the time of a much larger number of Federal employees on a continuous basis.[118]

A preliminary estimate of recurring annual baseline costs associated with creating and repairing electronic documents was developed using the following assumptions:

- The 199,526 Federal employees in the occupational categories included in Table D-3 spend at least some time creating or repairing Section 508-compliant electronic documents.
- The average Federal employee works 1,760 years annually, net of holiday, annual, and sick leave.

[117] Estimates of the proportion of development time required for testing and evaluation vary from 10 percent to 50 percent, depending on the type of project and what specific activities are included in testing and evaluation. This preliminary analysis uses the midpoint of the 20- to 30-percent range cited as a common rule of thumb in Alan Forand, "The Top Seven: Review Current Software Testing Misconceptions," Hewlett-Packard Viewpoint Paper, July 2013.

[118] Developing and disseminating compliant document templates reduces per-document recurring compliance costs but involves additional one-time and ongoing maintenance, updating, and training costs. We were not able to identify suitable data that could be used to estimate these specific cost elements.

- An average of 3 percent of these employees' time is required to ensure that the electronic content they produce or review is Section 508 compliant.[119]
- The value of time spent was calculated using the average hourly wage rate ($42.13) for the occupational category included in this analysis, multiplied by a factor of 1.54 to account for benefits and other non-wage compensation.

The baseline cost estimate calculations are presented in Table 15.

Table 15: Annual Baseline Cost of Section 508-Compliant Document Creation and Repair

Estimate Component	Value
Number of Federal employees	199,526
Average work hours per year	1,760
Percent of time spent on compliance	3%
Hours spent on document compliance	10,534,973
Direct cost per hour	$42.13
Multiplier to account for benefits	1.54
Loaded cost per hour	$65.06
Baseline document compliance cost	**$685,441,683**

Compliance costs for creating and repairing electronic documents prepared by Federal employees are estimated at $685.4 million annually.

6.1.6. Summary of Baseline Federal Agency Cost Estimates for In-House ICT

Combining the cost estimates for each component discussed above yields an estimate of total baseline compliance costs for Federal agencies. The component cost estimates are summarized in Table 16.

Table 16: Annual Baseline Federal Agency Compliance Costs for In-House ICT (Millions)

Cost Component	Annual Cost
Policy development and implementation	$115.2
Employee training	$38.6
Software, Web, and audiovisual development	$162.7
Software, Web sites, and audiovisual media evaluation	$40.7
Electronic documents creation and repair	$685.4
Baseline agency compliance costs for in-house ICT	**$1,042.6**

On a preliminary basis, we estimate that Federal agencies incur costs of approximately $1.0 billion annually to ensure that ICT developed, maintained, or used in house complies with the current Section 508 standards. However, this estimate does not include the costs associated with

[119] Three percent is the low end of the range cited as the increase in development time required to build accessibility into newly developed Web sites. No estimates are available for the percentage of time required to create and repair other types of electronic content. However, building accessibility into documents typically involves less time and effort than ensuring compliance with a much larger set of standards applicable to Web sites.

procurement of compliant ICT products, services, and content from Federal contractors and vendors. The costs associated with purchasing compliant ICT are estimated in Section 6.2 below.

6.2. Baseline Cost Estimates for Procured ICT

Federal agencies must also procure Section 508-compliant ICT hardware, software, services, and content from Federal contractors and vendors.[120] In contrast to the costs that Federal agencies incur to produce compliant ICT, the costs associated with compliant ICT produced by Federal contractors and vendors cannot be directly calculated:

- Adequate data on the size and characteristics of the Federal contractor workforce are not available.
- Contractors and vendors may not be able to recoup all of the costs of producing compliant ICT through existing or future contracts.
- Agencies sometimes procure partially compliant or noncompliant ICT when compliant products are not available or only available at a much higher cost.

The magnitude of these costs can be estimated indirectly, however, using data on the total size of the Federal ICT budget and ICT purchases from contractors and vendors. For the preliminary analysis, we have identified two estimates of the Federal ICT budget and calculated the estimate of annual ICT purchases using two alternative assumptions. This set of four estimates (two Federal budget estimates matched to two Federal purchase estimates) was used to develop an estimate of baseline compliance costs associated with procured ICT under the assumption that Section 508 compliance-attributable costs account for the same share of total costs for ICT developed in house and ICT procured from contractors and vendors.

6.2.1. Estimates of the Federal ICT Budget

As noted above, Federal agencies are required to provide data annually on IT project spending to OMB. Federal agencies' IT budgets have been flat for the past few years at a level of approximately $80 billion annually (see Table D-1 in Appendix D). This total includes spending by most, but not all, Federal agencies. It also may not include expenditures on certain types of ICT products and services (including multimedia production and telecommunications services) that may be covered under certain provisions in the current Section 508 standards. The Federal budget estimate of IT spending is appropriately regarded as a lower bound estimate of all spending covered by ICT accessibility requirements.

A more inclusive estimate of total Federal ICT spending is available from Deltek, a government accounting and business intelligence firm that provides projections of future contracting opportunities. Deltek estimates that Federal ICT spending totaled approximately $120 billion in 2012.[121] However, the Deltek budget figure includes spending on weapons systems and other forms of IT that may not be materially affected by the Section 508 requirements.

[120] These services include provision of contract employees performing work on site and off site for Federal agencies. However, ICT that is incidental to a contract is not covered under the current Section 508 standards, nor would it be under the proposed section E202.3.

[121] Deltek's Bjorklund said that "the difference is because the Deltek forecast tries to capture the whole Federal 'addressable' market, including the legislative and judicial branches and a host of independent and quasi-

In the absence of more precise estimates of the Federal ICT budget, we have used a consensus estimate of $100 billion annually (the average of the OMB and Deltek estimates) to calculate the potential share of Federal ICT spending that is accounted for by purchases from Federal contractors and vendors.

6.2.2. Federal Purchases of ICT Products and Services

The Federal Procurement Data System (FPDS Next Generation, or FPDS-NG, in its most recent form) provides source data on Federal ICT hardware, software, content, and service purchases. The 2011 FPDS-NG records for purchases in all potentially applicable NAICS sectors were reviewed, edited, and tabulated. Econometrica tabulations of the FPDS-NG data for 2011 are presented in Table D-2 in Appendix D.[122]

Based on the definition of IT provided in the OMB guidance to Federal agencies, it is likely that the amounts shown in Table D-2 for telecommunications services and multimedia production services are not included in the Federal IT budget estimates. However, these services clearly have to meet various accessibility requirements under the current and proposed Section 508 standards. If telecommunications and multimedia production services are included in the estimates of Federal IT spending, 2011 purchases of ICT products and services were $52.8 billion. If these services are excluded, 2011 purchases of ICT products and services totaled approximately $43.9 billion. The average of these two estimates is $48.3 billion.

6.2.3. Estimating the Share of Federal ICT Procured From Contractors and Vendors

The high and low estimates of total Federal ICT spending ($120 and $80 billion) and Federal ICT purchases ($52.8 and $43.9 billion) can be used to estimate the share of all Federal ICT that is procured from contractors and vendors. A range of estimates can be developed using the high and low estimates for each of these two variables as follows:

- Each of the two estimates of Federal ICT purchases can be divided into the OMB estimate of Federal IT spending (which is known to be somewhat understated) to get high-end estimates of the share of procured ICT.
- Each of the two estimates of Federal ICT purchases can be divided into the Deltek estimate of Federal IT spending (which is likely to be overstated with respect to the forms of ICT covered by Section 508) to get low-end estimates of the share of procured ICT.

governmental agencies, such as the U.S. Postal Service, Fannie Mae, Freddie Mac, and the Tennessee Valley Authority. The company also includes spending on IT systems contained within other programs, such as aircraft and weapons systems, and estimates on IT spending within the U.S. intelligence community." Quoted in Information Week, "Federal IT Spending Likely to Decline," June 20, 2012.

[122] While the ICT sector estimates presented in Appendix D do not include electronic documents and other electronic content created by non-ICT contractors and vendors, the compliance costs associated with creating compliant documents and content in this analysis are taken into account because the cost estimates for management, training, and document creation and repair are scaled from Federal expenditure and employment data that are not limited to the ICT sector.

Estimates of the share of Federal ICT procured from contractors and vendors are presented in Table 17.

Table 17: Estimates of Federal ICT Purchase Share, 2012

Calculation Element	OMB	Deltek
Federal ICT spending (millions)	$80.0	$120.0
High estimate of Federal ICT purchases (millions)	$52.8	$52.8
Low estimate of Federal ICT purchases (millions)	$43.9	$43.9
High estimate of Federal ICT purchase share	66%	44%
Low estimate of Federal ICT purchase share	55%	37%

The average of the four estimates of Federal ICT purchase share shown in Table 17 (48 percent) was used as a baseline estimate of the share of all Federal ICT that is procured from contractors and vendors.

6.2.4. Estimating Baseline Compliance Costs for Procured Federal ICT

Baseline compliance costs associated with procured ICT products and services can be estimated as follows:

- The ratio of procured ICT to in-house ICT spending is 0.923, estimated from the shares of total ICT spending estimated from the data in Table 17. Procured ICT accounts for 48 percent of total ICT spending, while in-house ICT accounts for 52 percent of total ICT spending.
- Applying the 0.923 ratio to baseline agency compliance costs for in-house ICT ($1.0426 billion from Table 16) yields an estimate of baseline compliance costs for procured ICT.

The calculation of baseline compliance costs for procured ICT is presented in Table 18.

Table 18: Annual Baseline Compliance Cost Estimate for Procured ICT

Calculation Element	Value
Share of total spending on procured ICT	48%
Share of total spending on in-house ICT	52%
Ratio of procured to in-house ICT spending	0.923
Baseline compliance cost estimate for procured ICT (millions)	**$962.3**

Baseline compliance costs for procured ICT were estimated at $962.3 million in 2011. It is important to note that this aggregate estimate of compliance costs for procured ICT does not depend on the extent to which contractors or vendors are able to pass on some or all of these costs in the form of higher prices charged to Federal agencies for compliant ICT products and services, because higher purchase costs and lower contractor profits both represent social costs of the current Section 508 standards.[123]

[123] It is also possible that some Federal contractors and vendors may spread the incremental compliance costs across all of the products and services they sell that incorporate these accessibility features. This would be most likely to occur in the markets for products such as general office software and end user hardware, because incremental costs of incorporating the required accessibility features into all units of the products sold would not be much greater than

Total baseline Section 508 compliance costs for agency-developed and -procured ICT are estimated at about $2.0 billion annually. This amount represents about 2 percent of annual Federal ICT spending, which is in the range between $80 billion and $120 billion, depending on what products and services are included in the total.

6.3. Baseline Cost Estimates for Complying With Current Section 255 Guidelines

Telecommunications equipment manufacturers incur costs to comply with the current Section 255 guidelines. Engineering, management, and marketing employee time is required to evaluate the accessibility and usability of manufacturers' products from the earliest stages of design through the entire lifecycle of production and subsequent improvements, modifications, and updates. Manufacturers also incur costs to develop and provide user guides, installation guides, and product support in alternative formats.

The most recent Census data available indicate that there were 1,384 U.S. communications equipment manufacturers (NAICS code 33411, 33421, and 33422) with 120,265 employees in 2011.[124] However, there are three reasons why these estimates may not adequately represent the numbers of firms and employees with Section 255 compliance responsibilities:

- Some of these manufacturers have product lines focused on areas (e.g., radio and television broadcasting, other communications equipment) that do not fall under the scope of the guidelines.
- A substantial portion of telecommunications equipment is imported.
- Documentation and support services may be developed or provided by third parties.

In any event, it is unlikely that the costs telecommunications manufacturers incur to comply with the equipment accessibility provisions in the current Section 255 guidelines can be estimated. For large manufacturers, compliance with these requirements appears to have been embedded in the overall product design and development process. For example, the AT&T universal design policy includes the following components:[125]

- Product development processes consider the universal design implications in the design of new products and services.
- Alternative means of access are incorporated where feasible and consistent with Section 255 and Section 508.
- Products and services adhere to existing industry accessibility standards and guidelines, including WCAG and hearing aid compatibility.

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if the manufacturers were to produce and sell separate versions of these products specifically to Federal Government customers. However, the aggregate amount of compliance costs incurred in this scenario would be unchanged, although the incidence of which parties bear the costs would be different.

[124] Census Bureau, "Number of Firms, Number of Establishments, Employment, and Annual Payroll by Enterprise Employment Size for the United States, All Industries: 2011," Statistics of U.S. Businesses.

[125] AT&T, "Solutions for Customers with Disabilities," last viewed January 30, 2014.

- Suppliers and vendors are encouraged to develop accessible products and services and include contract language about accessibility and compatibility, as appropriate.
- The needs of people with disabilities and older individuals are considered in market research, product conceptualization, human factors research, field trials, and product marketing.

However, it is possible to develop estimates of the annual costs incurred to conform with the current Section 255 guidelines relating to product documentation and support services using Access Board estimates of burden hours in the Paperwork Reduction Act (PRA) analysis section of the NPRM. The PRA identifies four categories of proposed information collection requirements for telecommunications equipment and CPE manufacturers:

- Support documentation must be offered that lists and explains how to use the accessibility and compatibility features of ICT.
- Electronic support documentation (Web site support, PDF versions of user's manuals) must meet the applicable accessibility standards (WCAG 2.0 or PDF/UA-1).
- Non-electronic support documentation must be provided in alternate formats (e.g., braille, large print) that are usable by users with vision impairments upon request.
- Support services (e.g., help desks) must offer accessibility and compatibility information, include a contact method (e.g., point of contact), and accommodate the communication needs of individuals with disabilities.

The PRA estimates that telecommunications equipment manufacturer employees or contractors would spend about 2.4 million hours annually to ensure that product documentation meets these requirements, which are generally similar to those under the current Section 255 guidelines. The monetized value of this employee time was calculated as follows:

- Data on communications equipment manufacturer employee occupations and hourly compensation are available from BLS. The employees preparing accessible product documentation were assumed to be technical writers and editors who had an average wage of $36.64 in May 2012.[126]
- Fringe benefits represented 30 percent of total compensation in the communications equipment manufacturing sector in 2012.[127]
- The fully loaded wage rate of $47.63/hour ($36.64 times the benefit multiplier of 1.3) was used to value employee time.

[126] BLS, "May 2012 National Industry-Specific Occupational Employment and Wage Estimates: NAICS 334200 – Communications Equipment Manufacturing." NAICS 334200 includes three subsectors: telephone apparatus manufacturing (334210), radio and television broadcasting and wireless communications equipment manufacturing (334220), and other communications equipment manufacturing (334290). However, the OES data do not provide data on employment and wages at the subsector level.

[127] Census Bureau, "Economic Census, Detailed Statistics by Industry for the United States: 2012," Table EC0731I1, 2012, released August 29, 2014.

Baseline costs for telecommunications equipment manufacturers to conform to the current Section 255 guidelines relating to product documentation and user support are estimated to be $114 million annually.

6.4. Summary of Baseline Section 508 and Section 255 Compliance Costs

Collectively, quantifiable costs to comply with the current Section 508 standards and Section 255 guidelines are estimated at $2.1 billion annually (see Table 19).

Table 19: Annual Baseline Compliance Cost Estimates (Billions)

Monetized Cost Component	Value
Baseline compliance cost for in-house ICT	$1.042
Baseline compliance cost for procured ICT	$0.963
Baseline compliance costs to conform with Section 255 product documentation and user support guidelines	$0.114
Total baseline compliance costs	**$2.119**

6.5. Request for Comment on Specific Aspects of Baseline Cost Estimates

1. Are the estimates of the numbers of Federal employees receiving Section 508 training, the direct costs per person of this training, and the average number of hours of training received annually presented in Section 6.1.2 reasonable?
2. Is it reasonable to attribute 5 percent of the time spent by Federal software and Web developers to Section 508-related activities, as this assessment does in Section 6.1.3?
3. Is it reasonable to expect that software and Web testing and evaluation requires about 1 hour for every 4 hours spent on development, as assumed in Section 6.1.4?
4. In Section 6.1.5, writers, editors, and other content creators are estimated to spend about 3 percent of their time ensuring that electronic documents and other electronic content are accessible. Is this a reasonable estimate?
5. Is any information available on the extent to which Section 508 requirements increase the costs of producing software, hardware, and telecommunications equipment sold to Federal agencies? Are these costs typically recouped in higher prices charged to Federal clients, or are they incorporated into the prices charged to all customers?
6. Is any information or data available on the costs incurred by telecommunications manufacturers to develop and produce equipment that complies with the current Section 255 guidelines?

7. Factors Affecting Future Compliance Costs Under the Current ICT Standards and Guidelines

7.1. Factors Affecting Federal Agency Section 508 Compliance Costs

There are several factors that will collectively lead to changes in Federal agency compliance rates and costs in the next few years, even if the proposed updates to the current Section 508 standards are not adopted. Recent Federal Government initiatives are focusing attention and resources on measuring and improving agency Section 508 compliance rates, while IT budget constraints have both limited available resources and prompted efforts to use them more efficiently:

- In 2013, OMB released a strategic plan for addressing current Section 508 compliance shortfalls.[128] Agencies are now required to provide annual reports on progress made in achieving these goals. At a minimum, this initiative is likely to increase the short-term costs associated with policy development, implementation, and employee training. Some agencies will also come under pressure to improve compliance rates for various forms of covered ICT.
- As noted above, increased focus in the past few years has been directed toward creating accessible electronic documents that are widely circulated or available to the public, even if they are not posted on public-facing Web sites.[129] This emphasis will increase the numbers of employees who have to be trained in how to create accessible documents, as well as agency technical support capabilities and staff resources. Increased agency efforts to produce and distribute compliant electronic content can be expected to increase baseline compliance costs in the short term.
- Federal IT budgets have been sharply constrained in the past 4 fiscal years, with essentially no growth projected for the next few years as well.[130] These budgetary limitations could mean that the proposed Section 508 standards could:
    - Divert resources from already planned or implemented compliance activities to fund new policy development and training requirements.
    - Leverage the availability of existing external resources to support improved compliance with both the current and proposed Section 508 standards.
- Several cross-agency technical support and ICT evaluation initiatives have been launched to reduce the duplication of effort and reduce the costs associated with policy development and testing of ICT products and services procured by multiple agencies:
    - Enterprise architecture review is being used to ensure that agency components adopt common Section 508-compliant hardware and systems software solutions.[131]

[128] OMB, "Strategic Plan for Improving Management of Section 508 of the Rehabilitation Act," January 24, 2013.
[129] See, for example, Department of Veterans Affairs (VA), "Section 508 Conformance Requirement for Electronic Documents," June 20, 2012.
[130] Steven VanRoekel, U.S. Chief Information Officer, "Federal Information Technology, FY 2014 Budget Priorities," undated presentation.
[131] Executive Office of the President, "The Common Approach to Federal Enterprise Architecture," May 2, 2012.

- The trusted tester program now permits agencies to purchase ICT that has already been certified as Section 508 compliant by other agency evaluations.[132]
- Staff members from 22 Federal agencies are collaborating on a Government-wide effort (the Accessible Electronic Document Community of Practice) to provide additional resources and support for efforts to increase the share of electronic documents that are accessible.

Some of these initiatives have incorporated the adoption and use of WCAG 2.0-based standards, particularly in the areas of Web/software testing and electronic document creation and repair. However, it is reasonable to expect that there would still be substantial transition costs associated with switching to the proposed ICT standards, even for agencies that have had adequate capabilities and resources available to achieve and maintain substantial compliance with the current Section 508 requirements.

7.2. Factors Affecting Telecommunications Manufacturer Costs to Comply With the Section 255 Guidelines

Since the current Section 255 guidelines were adopted, the telecommunications equipment sector (especially smartphones and other wireless communications devices) has been characterized by rapid evolution of devices, platforms, applications, and consensus standards. We assume that this pace of innovation will continue whether or not the proposed ICT standards and guidelines are finalized.

This consideration is particularly relevant when assessing the potential impact of the proposed requirement that telecommunications devices with display screens support RTT. Recent developments suggest that device support for RTT may be much more widely implemented by the time any proposed updates to the ICT standards and guidelines would take effect:

- In response to the FCC's 2011 NPRM regarding the next generation of emergency calling services (NG 9-1-1), Verizon and Verizon Wireless supported the adoption of RTT capabilities into the NG 9-1-1 system, noting that "Verizon's product development and network teams also are engaged in text-to-911 and NG911-related standards development efforts, including the incorporation of RTT capability into future device requirements."[133]
- A consortium of European companies appears to be offering support for RTT services. The RTT Service promoted by the RTT Alliance is a carrier-class implementation of the RTT standard, offering mobile and Web-based user interfaces.[134]

Similarly, the international adoption of increasingly harmonized standards for document accessibility can be expected to increase the availability of software features and templates that

[132] Access Board, "Trusted Tester Program," Section 508 Webinar, April 03, 2014.
[133] FCC, "In the Matter of Facilitating the Deployment of Text-to-911 and Other Next Generation 911 Applications, PS Docket No. 11-153, and Framework for Next Generation 911 Deployment, PS Docket No. 10-255," September 22, 2011; Comments of Verizon and Verizon Wireless submitted to the docket, March 11, 2013.
[134] HTK Horizon, "HTK Horizon Hosted Telecom Services Supporting the Real-Time Text Alliance," viewed December 2013.

could reduce the amount of time required for telecommunications equipment manufacturers to prepare accessible electronic documentation and Web support materials.

8. Current Practices and Potential Incremental Costs Associated With Major New Requirements in the Proposed Rule

Many aspects of the proposed Section 508 requirements are not likely to entail measurable increases in compliance costs.[135] In some areas, the proposed references to WCAG 2.0 would provide more specific objective checkpoints that could be used to test and evaluate compliance with requirements that already exist in the current standards. For example, the current Section 508 requirement "A text equivalent for every non-text element shall be provided" would be augmented by specific WCAG 2.0 provisions applicable to controls, input, and time-based media. This increase in specificity is likely to increase the extent of testing and evaluation required to establish that covered ICT is compliant, but it is also likely to reduce long-term costs for agencies and vendors that already attempt to produce compliant content and products. The proposed standards may also make it easier for developers to identify and remediate noncompliant content and products.

However, some of the proposed standards represent expansions of or additions to current Section 508 requirements. Proposed revisions to the current Section 508 standards and Section 255 guidelines were identified and discussed in Section 4.4. In this section, we present information on current agency and industry practices and assess the extent to which these practices largely conform to the proposed standards or, alternatively, indicate that significant work will be required to achieve compliance.

8.1. Area 1: Applying WCAG 2.0 to Software and Applications

Several major software vendors currently provide users with extensive online assistance on producing accessible content. These accessibility resources are typically oriented to providing generalized accessibility support rather than assisting developers and content creators to comply with a specific set of accessibility standards such as the current Section 508 standards. We also anticipate that these resources would be updated to support the proposed Section 508 standards.

However, additional resources for software development, coding, and evaluation would be required to ensure that software platforms, toolkits, and applications comply with the entire set of WCAG 2.0-based requirements, particularly those that do not have analogues or predecessors in the current Section 508 standards. Some of the associated costs can be expected to decrease over

[135] We have used the term "measurable increases in compliance costs" in this analysis because compliance with some provisions may take no time at all (i.e., for Web developers already using correct programming techniques, the parsing and page language provisions would simply require them to do what they do already). For other situations, these provisions may require a one-time change in technique or approach to a method that may make it easier to update or modify the ICT in the future. Consequently, there would not be measurable increases in cost in these situations.

time as developers become more familiar with the updated standards, but the proposed standards would increase the number and specificity of software accessibility requirements that would need to be addressed on a continuing basis.

In addition, software developers (both Federal and contractor employees) would require additional training, and government evaluation, testing, and acquisition protocols would need to be revised. We expect that most of the costs associated with these activities would be incurred on a one-time basis. These costs are estimated in Sections 9.1.2, 9.1.3, and 9.1.4.

8.2. Area 2: Accessibility Features Within Software Applications and Operating Systems

Federal agencies could comply with this requirement by developing or purchasing applications and operating systems that provide the APIs that would be required. It is not clear that this would increase software development or acquisition costs because these applications, platforms, and systems appear to be readily available in the current marketplace.[136]

8.3. Area 3: Authoring Tools

Vendors who develop and market authoring tools will incur significant costs to design and implement the capabilities required by the proposed standards. However, the significant limitations in current software are already being widely addressed by voluntary or de facto standards developed by leading ICT companies, trade associations, or third-party standards organizations. In addition, Web site authoring tools, user agents, applications, and content are increasingly required to support creation and maintenance of WCAG 2.0-compliant (or equivalent) Web sites for for-profit and nonprofit entities, as well as for most foreign governments in developed countries.

We expect that authoring tools will increasingly incorporate features to produce and maintain accessible content even if the current Section 508 standards are not updated. The proposed requirements do not appear to extend past the boundaries of other existing or emerging standards and therefore may not result in identifiable incremental costs.[137]

8.4. Area 4: Assistive Technology

The proposed standards include a provision that would require software that functions as assistive technology to use standard platform accessibility services. Our preliminary research indicates that most current-generation AT software already makes use of standard APIs, so the impact of these requirements may be limited to accelerating the phase-out or replacement of

[136] See, for example, Adobe Accessibility, "Accessing PDF Documents with Assistive Technology: A Screen Reader User's Guide."

[137] This does not imply that the authoring tools currently used by Federal agencies all comply with the proposed standards. Rather, it is the case that the tools developed or purchased by Federal agencies can be expected to comply with them over time, even if the current Section 508 standards are left in place. This is especially true for authoring tools that appear to have expanded capabilities to produce accessible content in recent releases.

legacy AT equipment and applications.[138] Consequently, no identifiable costs were estimated for Federal agencies to comply with this proposed requirement.

8.5. Area 5: Electronic Content and Data

The amount of time required for individual authors and editors to produce WCAG 2.0-compliant documents and other forms of electronic content will depend in large part on the availability, cost, and usability of agency, vendor, and third-party compliance guidance (particularly in the form of "how to" materials, product templates, and other support). It will also depend on the extent to which employees producing or editing covered content receive sufficient training and have access to adequate support resources.[139] These costs are estimated in Section 9.1.5.

8.6. Area 6: Color and Contrast Settings

The adoption of testable requirements would increase the time required to evaluate software, Web sites, and audiovisual media, but it would also simplify the evaluation and reduce the need to make subjective judgments about compliance.[140] For example, the proposed requirement for a specific minimum contrast ratio requirement could increase the number of instances in which selected images, graphics, and backgrounds in applications and content must be altered to achieve compliance. However, the time required to change color contrast is typically minimal, and developers would be able to accommodate these requirements in newly developed content and applications without additional time and effort.

Consequently, no specific estimates of Federal agency costs associated with complying with the proposed requirements in this area were developed. Instead, the impact of these proposed requirements is embedded in the overall cost estimates developed for software, Web, and multimedia development and evaluation (Sections 9.1.3 and 9.1.4) and electronic content (Section 9.1.5).

8.7. Area 7: Audio Controls on Web Pages

Web developers and site administrators would have to evaluate current and newly developed audiovisual content and applications to ensure that they comply with the proposed requirement. However, many Web sites and software applications currently comply with this standard, and the changes required to make noncomplying ICT meet this standard can be accomplished with relatively little developer time and effort. In many cases, the following advice will be sufficient:[141]

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[138] For example, the Microsoft Active Accessibility API for accessibility was introduced as a platform add-on to Microsoft Windows 95 in 1997. Similar API capabilities have been developed, maintained, and documented for Apple, Google, Linux, and Oracle-based systems.

[139] In our cost estimates, we assume that Federal employees receive sufficient training and access to adequate resources that enable them to produce content that complies with the proposed standards without incurring more time than is necessary to ensure that content meets the current standards.

[140] Several free color-checking tools, such as Firefox Colorzilla, are available for Web developers and content creators.

[141] HowTo.gov, "Making Multimedia Section 508 Compliant and Accessible," updated July 26, 2013.

> Rather than setting videos and other multimedia with sound to start playing when your web page loads, allow your users to start the media. Otherwise, the sound will interfere with content read by screen readers and refreshable Braille displays.

In Web and software applications, compliance is achieved by specifying one option on the default settings rather than another. Both are currently in use, and switching from one to the other does not require a measurable amount of programming time or effort. Consequently, no specific estimates of Federal agency costs associated with complying with this proposed requirement were developed.

8.8. Area 8: User Controls for Captions and Video Description

We have not been able to identify adequate data and information that can be used to quantify the potential impact of the proposed standards in this area. Data and other information on market trends and costs relating to these proposed requirements are specifically requested in Section 8.12 below.

8.9. Area 9: RTT Functionality

In discussing the costs of RTT to industry, the TRACE RA Proposal states that it "does not require any additional hardware (displays, keyboards, etc.) beyond what a phone/device already has for other functions. Open source versions of the software (stacks and Codecs), as well as some commercial versions (including reference designs) needed to receive and send real-time text, are available. As a result, the costs associated with this proposal are primarily in the initial implementation for a company or transport technology. But even these costs will be kept down if real-time text design is incorporated in the beginning of the design process. At that stage, these costs should be merely a small fraction of the overall design costs, which can be amortized across all of the products sold—and carried forward to future designs. Indeed, given the capabilities of modern VoIP devices (the only type of devices to which this proposal applies), the small software (including firmware) changes needed should not add any significant cost to the manufacture of the products."[142]

We have not been able to identify adequate data and information that can be used to quantify the potential impact of the proposed standards in this area. Data and other information on market trends and costs relating to the proposed requirement for telecommunications devices with display screens to support RTT are specifically requested in Section 8.12 below.

As discussed in Section 5.5 above, the Access Board is seeking input from the public on whether to retain the RTT provisions in the proposed Section 508 standards and Section 255 guidelines in light of the FCC's report. The Board is interested in hearing from manufacturers and service providers on whether complying with the proposed RTT requirements would impose costs in addition to those identified by the FCC for implementing SMS-based text to 911, and if so, to

[142] TRACE Proposal, p. 17.

identify the scope and nature of those costs and quantify wherever possible. Questions have been included in Section 8.12 below.

8.10. Section 508 Hardware and Equipment Costs

We have not been able to locate adequate data to characterize the extent to which Federal agencies are currently able to purchase specific categories of accessible telecommunications equipment, video and multimedia products, "self-contained closed products," and computers (the four categories of hardware specifically covered by the current standards).[143] Consequently, we are not able to estimate the baseline level of purchases of Section 508-compliant hardware and the incremental costs associated with purchasing hardware that incorporates the required accessibility features. Data and other information on potential costs relating to making hardware and equipment compliant with the proposed requirements are specifically requested in Section 8.12 below.

8.11. Section 255 Electronic Documentation and Support Costs

To ascertain the extent to which product documentation and support content on telecommunications manufacturer Web sites are currently accessible to people with disabilities, Econometrica identified and briefly reviewed the product support pages of 25 leading telecommunications equipment manufacturer Web sites.[144] Each manufacturer Web site was reviewed to determine if product support information could be readily accessed from the home page by means of a direct link or a Javascript menu. Where a landing page for the product support section could be identified, that page was evaluated for the subset of accessibility issues that can be identified using the WebAIM.org WAVE checker.[145]

It is explicitly noted that the number of accessibility errors detected by the WAVE checker may not be indicative of the actual degree to which the structure and content of the support home page is accessible, and different types of errors can require widely varying degrees of effort to repair. With this disclaimer, the results of this review are presented in Table 20.

[143] For example, we were not able to identify any GSA materials that provided any information on the availability or cost of equipment offered in compliant and noncompliant versions (relative to the current Section 508 standards).

[144] This review included the Web sites of 25 of the 50 manufacturers with contact information listed on FCC, "Section 255 Manufacturers," last viewed January 30, 2014.

[145] The Web Accessibility Evaluation Tool (WAVE) is developed and made available as a free community service. WebAIM.org provides more information on this tool on the WAVE help page, which also includes important information about the limitations of automated Web page accessibility evaluation.

Table 20: Telecommunications Equipment Manufacturer Support Pages

Telecommunications Equipment Manufacturer Site*	Support Page Link on Home Page?	Support Page Errors**
Alcatel	Yes	15
Apple Inc.	Yes	0
Canon USA	Yes	1
Cisco Systems, Inc.	Yes	24
Ericsson, Inc.	No	N/A
Hewlett-Packard Company	Yes	0
HTC Corporation	Yes	17
Kyocera Wireless Corporation	Yes	19
LG Electronics MobileComm U.S.A., Inc.	Yes	34
Lucent	Yes	4
Microsoft Corporation	Yes	3
Mitel Networks, Inc.	No	N/A
Motorola Mobility	No	N/A
NEC Corporation of America	Yes	6
Nokia	Yes	2
Panasonic Corporation of North America	Yes	74
RadioShack Corporation	No	N/A
Research in Motion Limited/RIM	Yes	6
Samsung Telecommunications America	No	N/A
Sharp Electronics	Yes	28
Skype Communications Sarl	Yes	1
Sony Mobile Communications (USA), Inc.	Yes	1
Toshiba America Information Systems, Inc.	Yes	5
Uniden America Corporation	Menu***	3
VTech Telecommunications, Ltd.	Menu***	5

*Companies listed on FCC, "Section 255 Manufacturers," January 29, 2014.
**Identified using WebAIM.org WAVE checker, January 29, 2014.
***Support FAQ page reviewed.
Source: Econometrica, Inc., review of Web pages in table hyperlinks.

This review indicated that about half of the support pages reviewed (13 of 25) had fewer than 10 errors identified by the WAVE checker. This group includes the support home pages of several leading mobile phone manufacturers, including Apple, Nokia, and Research in Motion, as well as those of cordless handset manufacturers such as Uniden and VTech. These pages generally appear to require relatively modest revisions to improve accessibility.

Another seven pages had more extensive accessibility issues, some of which could potentially limit the ability of users with vision disabilities to be able to locate and review material on specific products or issues of concern. The Web sites of the remaining five manufacturers do not provide a clear link to the support services section on the home page, which may further complicate users' ability to locate and review product documentation and other support content.

8.12. Request for Comment on Compliance Costs

1. Relatively few, if any, authoring tools available are compliant with the current W3C ATAG 1.0 guidelines. Is this mostly due to feasibility, cost, or lack of customer demand?
2. Would the requirement to provide captioning and audio description controls impose additional costs on manufacturers? Would that burden be mitigated if the requirement for caption and audio description controls be limited only to certain types of hardware, such as remote controls?
3. Which proposed Section 508 requirements, if any, will increase compliance costs for manufacturers and sellers of ICT hardware and equipment? Specifically:
    a. Are there any data available on the difference in the cost of ICT that meets the 508 accessibility requirements and ICT that does not meet them?
    b. Are there some product types where the cost differences are de minimis and others where the cost differences are more pronounced?
    c. Are there certain accessibility features that are more costly to incorporate into products and result in higher prices reflected in procurements?
4. Do any other specific provisions of the WCAG 2.0 standards impose additional compliance costs compared to the current Section 508 regulations? If so, which provisions? What is the estimated difference in cost between complying with the current requirement(s) and the proposed requirement(s)?
    a. Web site standards.
    b. Operating systems and applications software.
    c. Hardware and telecommunications equipment.
    d. Self-contained, closed products.
    e. Documents and other non-multimedia content.
    f. Multimedia content/image-based software.
5. Are there substantial technical or cost issues associated with implementing support for the proposed RTT standard on the following?
    a. Customer devices.
    b. Telephone network equipment.
    c. Online video communication software and displays.
    d. Other components of wireline and wireless telephone networks.
6. Is any information or data available on the share of the U.S. telecommunications market that is expected to have the capability to support RTT functionality in the next 3 to 5 years?

9. Preliminary Cost Estimates for the Proposed Rule

Ideally, this preliminary assessment would include estimates of the incremental costs associated with meeting each of the proposed accessibility standards. However, the increase in compliance

costs attributable to specific provisions depends on the extent of current compliance with the proposed requirement across affected entities and various types of ICT products, software, services, and content.

Our interviews with agency representatives indicated that there is substantial diversity in current compliance rates—whether measured against the current Section 508 standards or those in the proposed rule—within and among agencies, agency components, and types of ICT. In addition, the amount of effort and cost that would be incurred to ensure that some form of ICT complies with a specific provision in the proposed standards depends on the extent to which it already complies with other provisions in the proposed requirements. Consequently, it is not possible to develop estimates of the potential increases in costs that would result from separately implementing each of the individual provisions included in the proposed rule.

The approach used instead in this analysis was to evaluate the potential impact of the proposed requirements (particularly those discussed in Section 8 above) on each of the five compliance cost components (e.g., policy development, training) included in the baseline cost estimates developed and presented in Section 6. The sum of these component estimates were used to develop overall estimates of the projected increases in costs for in-house procured ICT.

We were also unable to develop quantitative estimates of the costs that telecommunications manufacturers would incur to comply with the proposed rule of the current Section 255 guidelines, including the requirement to support RTT and to provide accessible support documentation and services.

9.1. Federal Agency Compliance Costs for In-House ICT

9.1.1. Section 508 Policy Development and Implementation

The proposed rule would require revisions to current agency Section 508 policies, guidelines, information dissemination, and compliance monitoring practices. We expect that agencies will incur a substantial one-time fixed cost associated with adoption of revised standards:

- Section 508 offices and coordinators would need to review and revise all existing policy directives and guidance for agency employees.
- These revised materials would need to be disseminated and discussed with personnel in each agency component who have significant Section 508 compliance responsibilities.
- Current compliance measurement and tracking programs and reports would also need to be revised.

For this preliminary analysis, we have assumed that agencies would incur a one-time cost to support the transition to the proposed Section 508 standards equal to as much as 100 percent or as little as 25 percent of the current baseline cost for policy development and implementation activities. A point estimate of 50 percent was used to develop an estimate of the projected one-time impact of the proposed rule on policy development and implementation costs.

Recurring annual costs would likely increase by a small percentage as well, because the proposed standards and guidelines are more extensive and specific than the current Section 508

standards. However, Section 508 offices and coordinators would be able to draw on an expanded set of interagency and external resources to support their activities because the proposed standards would require less ongoing interpretation and less agency-specific directives and guidance than is the case with the current Section 508 standards. It is possible that these recurring costs would not ultimately be higher than they would be under the current standards. However, we assumed that recurring annual costs for policy development and implementation would increase by an average of 5 percent in this preliminary analysis.

A preliminary estimate of the impact of the proposed Section 508 standards on this component of compliance costs for Federal agencies is presented in Table 21.

Table 21: Projected Cost Increase for Policy Development and Implementation

Estimate Component	Value
Baseline costs (millions)	$115.2
Projected increase (initial)	50%
Initial cost increase (millions)	**$57.6**
Projected increase (recurring)	5%
Recurring cost increase (millions)	**$5.8**

Federal agency budget constraints are likely to limit the extent of any increase in the resources available to Section 508 offices and coordinators for the next few years. Therefore, we have assumed that the initial cost increase of $57.6 million would be spread over a 2-year period, with recurring costs of $5.8 million incurred annually during each of the remaining 8 years in the 10-year analysis period.

9.1.2. Training of Federal Employees

The proposed rule would require extensive additional training for Federal agency IT employees, as well as employees involved in contracting, writing, editing, audiovisual production, and the other occupations included in Table D-3. Agencies would be likely to incur a substantial one-time increase in training costs associated with adoption of revised standards:

- Software developers would need to be trained on the techniques that can be used to satisfy the WCAG 2.0 Level A and Level AA Success Criteria and Conformance Requirements for non-Web ICT (see Section 8.1). They would also need information on the proposed requirements for support of accessibility services and authoring tools (see the discussion in Sections 8.2 and 8.3).
- Web and other content developers would need to be informed about the more detailed requirements in the proposed rule relating to issues such as color contrast, text resizing, audio controls, and captioning (see the discussion in Sections 8.6 through 8.8).
- Employees evaluating in-house ICT would need to understand the more specific and extensive benchmarks that must be satisfied to ensure that procured or developed ICT complies with the proposed standards.

For this preliminary analysis, we have assumed that agencies would incur additional one-time training costs in an amount equal to the current annual baseline cost for Federal employee

training.[146] Recurring annual costs would also be likely to increase by a small percentage because the proposed standards and guidelines are more extensive and specific than the current Section 508 standards. For this preliminary analysis, we have assumed that this recurring increase in policy development and implementation costs would average about 10 percent after the first year.

A preliminary estimate of the cost of the proposed Section 508 standards attributed to training Federal employees is presented in Table 22.

Table 22: Projected Cost Increase for Federal Employee Training

Estimate Component	Value
Baseline costs (millions)	$38.6
Projected increase (initial)	100%
Initial cost increase (millions)	**$38.6**
Projected increase (recurring)	10%
Recurring cost increase (millions)	**$3.9**

Federal agencies currently have very restricted budgets for training. The preliminary analysis estimates assume that the initial cost increase of $38.6 million would be spread over a 2-year period, with recurring costs of $3.9 million incurred annually during each of the remaining 8 years in the 10-year analysis period.

9.1.3. Developing Accessible Software, Web Sites, and Audiovisual Media

Software and Web developers would require additional time to ensure that the platforms and applications they create and modify comply with the proposed application of WCAG 2.0 standards to software:[147]

- Design time would be required to ensure that software would comply with the proposed Section 502 requirements for interoperability with AT accessibility services (see Section 8.2).
- Developers of authoring tools would need additional time to ensure that this software complies with the proposed Section 504 requirements (see Section 8.3).
- Developers of software that functions as AT would need additional time to ensure that these applications comply with the proposed Section 503 requirements for AT (see Section 8.4).
- Multimedia developers would need to spend time to comply with the proposed requirements for captioning and user controls (see Sections 8.7 and 8.8).
- Additional time would be required for these employees to develop compliant program documentation and support materials.

[146] The size of this projected increase is attributable in part to the relatively small reported number of hours of Section 508 training currently provided to Federal IT staff and other employees with compliance responsibilities.
[147] See discussion in Sections 4.4.1 and 8.1.

The costs associated with this additional time would be incurred on a continuing basis. However, there are several reasons why the amount of time required for these activities would decline after an initial adjustment period:

- Developers would become increasingly familiar with the proposed requirements and would learn better techniques for designing in compliance in early stages of ICT projects.
- Successful approaches would be incorporated into templates that could be reused on new projects.
- Newly hired developers would be more likely to have been trained on the proposed accessibility requirements.

For this preliminary analysis, we have assumed that it would initially take developers of software, Web, and multimedia ICT 20 percent longer to develop compliant platforms, applications, and content than is currently required, but only half as long to do so after the initial phase-in period.

A preliminary estimate of the impact of the proposed Section 508 standards on ICT development costs for Federal agencies is presented in Table 23.

Table 23: Projected Cost Increase for Software/Web/Multimedia Development Compliance

Estimate Component	Software Development	Web Development	Audiovisual Production	All Applications
Baseline costs (millions)	$138.3	$18.0	$6.4	$162.7
Projected increase (initial)	20%	20%	20%	20%
Initial cost increase (millions)	**$27.7**	**$3.6**	**$1.3**	**$32.5**
Projected increase (recurring)	10%	10%	10%	10%
Recurring increase (millions)	**$13.8**	**$1.8**	**$0.6**	**$16.3**

Software development typically takes place over an extended period of time. The preliminary analysis estimates assume that the initial cost increase of $32.5 million would be spread over a 2-year period, with recurring costs of $16.3 million incurred annually during each of the remaining 8 years in the 10-year analysis period.

9.1.4. Evaluation of Software, Web Sites, and Audiovisual Media for Compliance

In our analysis of baseline costs, we assumed that evaluation of software applications, Web sites/forms/applications, and audiovisual media currently accounts for 25 percent of the total time spent developing these products. The increase in the number and specificity of the standards under the proposed approach for software and Web sites means that more evaluation time will be required in the design, implementation, and testing stages for these products. The preliminary analysis assumes that the proposed rule would initially require a 20-percent increase in evaluation and testing time.[148]

[148] This is an estimate of the time that would be required to evaluate compliance with the full set of proposed standards. Different provisions in the proposed standards will be applicable for varying types of software, Web sites, and audiovisual media. The addition or deletion of single provisions from the proposed requirements would not be likely to materially affect the total time required.

It is possible that the amount of time required for evaluation and testing could decline after an initial adjustment period. However, current initiatives such as the trusted tester program have already begun to reduce the recurring costs of ICT accessibility evaluation and testing, and it is not clear the proposed standards would provide future opportunities for additional cost savings from interagency evaluation and testing, relative to the current standards. Consequently, the preliminary analysis assumes that the incremental increase in evaluation and testing effort (20 percent over current baseline hours) would be required on a continuing basis.

A preliminary estimate of the impact of the proposed Section 508 standards on compliance evaluation and testing costs for Federal agencies is presented in Table 24.

Table 24: Projected Cost Increase for Software/Web/Audiovisual Media Evaluation

Estimate Component	Software Evaluation	Web Evaluation	Audiovisual Evaluation	All Applications
Baseline costs (millions)	$34.6	$4.5	$1.6	$40.7
Projected increase (initial)	20%	20%	20%	20%
Initial cost increase (millions)	**$6.9**	**$0.9**	**$0.3**	**$8.1**
Projected increase (recurring)	20%	20%	20%	20%
Recurring increase (millions)	**$6.9**	**$0.9**	**$0.3**	**$8.1**

The preliminary analysis estimates that the Federal Government would incur increased costs of $8.1 million annually to evaluate and test agency-developed ICT.

9.1.5. Creation and Repair of Electronic Documents

The proposed rule would provide specific categories of electronic documents and other content that would have to comply with the Section 508 standards. Based on our interviews with agency representatives, agencies have not yet been able to ensure that most of the electronic content produced in some of these categories is compliant with the current accessibility requirements. However, current Federal Government initiatives may mean that increased agency attention and effort will need to be devoted to electronic document and content accessibility in the next few years, irrespective of whether or not the proposed standards are adopted (see the discussion in Section 7). Thus, the potential impact of incorporating specific categories of covered documents and content in the proposed Section 508 standards on volume of these materials that must be made accessible is not clear.[149]

It is also not clear that complying with the proposed standards and guidelines for electronic content would require additional time and effort for authors and editors of conventional documents, spreadsheets, and PDFs relative to ensuring that these types of content comply with the current Section 508 standards. However, the proposed standards are more specific and testable, so these forms of ICT may be prepared more thoroughly and attentively.

In addition, there are other forms of electronic content (presentations, project management software output, accounting and financial software reports) that may require more effort to make

[149] Also see the previous discussion in Sections 4.4.5 and 8.5.

compliant under the proposed standards because current authoring tools and templates may provide lower or less consistent support for incorporating accessibility.

Based on these considerations, the preliminary analysis assumes that creators and editors of electronic content would initially require 10 percent more time on average to ensure that covered materials comply with the proposed standards.[150] As Section 508-compliant authoring tools and templates become more widely available and employee training is completed, it would be reasonable to assume that the additional time that would be required to create or repair electronic content would be reduced in future years. The preliminary analysis assumes that the incremental time required after a 2-year phase-in period would be half of the amount assumed for the first 2 years after the proposed standards are adopted.

Because incremental costs are calculated based on a proportion of baseline costs, it is thereby assumed that the types of Federal employees (i.e., job categories) needed to create or repair accessible electronic documents under the proposed Section 508 standards would be the same as those employees needed under the current standards (See Table D-3). It is possible that, under the proposed 508 Standards, other types of Federal employees might spend time creating or repairing electronic content who do not currently engage in these tasks. However, no suitable information or data is available at this time on which to base incremental estimates of time spent by new categories of Federal employees. Accordingly, in Section 9.5, we request comment on other categories of Federal employees (i.e., job categories not included in the baseline cost assumptions in Table D-3) who potentially may need to spend time creating or remediating electronic documents under the proposed Section 508 standards.

A preliminary estimate of the impact of the proposed Section 508 standards on electronic document creation and repair costs for Federal agencies is presented in Table 25.

Table 25: Projected Cost Increase for Section 508-Compliant Document Creation and Repair

Estimate Component	Value
Baseline costs (millions)	$685.4
Projected increase (initial)	10%
Initial cost increase (millions)	**$68.5**
Projected increase (recurring)	5%
Recurring cost increase (millions)	**$34.3**

The preliminary analysis estimates that the Federal Government would incur increased costs of $68.5 million in each of the first 2 years of the 10-year analysis period to create and repair electronic documents. The recurring cost is estimated to be half as much ($34.3 million annually) in each of the remaining years in the analysis period.

9.1.6. Overall Increase in Agency Compliance Costs for In-House ICT

As noted above, there is a substantial degree of uncertainty associated with the impact of adopting specific provisions included in the proposed rule on Federal agency compliance costs.

[150] Different provisions will be applicable for varying types of electronic documents and other electronic content. The addition or deletion of single requirements would not materially affect the total time required.

The discussion provided in Sections 9.1 through 9.4 makes clear that the extent of this uncertainty can be potentially reduced by assessing the potential impact of the proposed rule at an aggregated level of analysis. However, the potential percentage increases in specific categories of costs could plausibly be much higher or lower than those used to develop the preliminary estimates of incremental compliance costs in this preliminary analysis.

Table 26 presents the ranges of percentage increases for each cost component that were examined before selecting a point estimate to develop the preliminary estimates of compliance costs that would be incurred by Federal agencies from the proposed rule. Comments on the range of potential increases in costs and the point estimates used to estimate these costs are specifically requested.

Table 26: Preliminary Percentage Increases in Agency Compliance Costs for In-House ICT

	One-Time Costs			Recurring Annual Costs		
Cost Component	**High**	**Low**	**Point Estimate***	**High**	**Low**	**Point Estimate***
Policy development and implementation	100%	25%	50%	10%	0%	5%
Employee training	200%	50%	100%	20%	5%	10%
Software, Web, and audiovisual development	40%	10%	20%	20%	5%	10%
Software, Web sites, and audiovisual media evaluation	40%	10%	20%	40%	10%	20%
Electronic documents creation and repair	20%	5%	10%	10%	0%	5%

*Estimate used in the compliance cost calculations.

In the absence of better data or more available information on the potential impact of the proposed standards, the point estimates of the projected increases in one-time and recurring costs shown in Table 26 were used to develop the component cost estimates presented in Sections 9.1 through 9.4.

The projected increases in costs for these five components were aggregated to develop preliminary estimates of the overall increase in compliance costs for Federal agencies attributable to the proposed standards and guidelines. Preliminary estimates of the impact of the proposed Section 508 standards for overall compliance costs for Federal agencies are presented in Table 27.

Table 27: Projected Increase in Annual Agency Compliance Costs for In-House ICT (Millions of 2015 Dollars)

Cost Component	Initial Cost	Recurring Cost
Policy development/implementation	$57.6	$5.8
Employee training	$38.6	$3.9
Software/Web/audiovisual development	$32.5	$13.8
Software/Web/audiovisual evaluation/testing	$8.1	$8.1
Electronic document creation/remediation	$68.5	$34.3
Overall increase in agency costs for in-house ICT	**$205.4***	**$65.8***
Percentage of annual baseline costs for in-house ICT	20%	6%

*Cost numbers do not sum to total because of rounding.

During the first 2 years after the proposed standards and guidelines take effect, Federal agencies are projected to incur additional one-time costs to transition to the rule Section 508 standards. These one-time costs are projected to be about $205 million, or 20 percent of the annual baseline costs of $1.0 billion estimated for agencies to comply with the current Section 508 standards.

Based on our preliminary assumptions about the impact of specific areas included in the proposed standards and guidelines on baseline compliance costs, the increase in recurring overall Federal agency compliance costs is projected to be approximately $65 million annually. This represents an increase of about 6 percent of annual baseline compliance costs estimated for agencies to comply with the current Section 508 standards.

In accordance with OMB regulatory review guidelines, the annual values of total monetized costs were calculated over a 10-year analysis period (assumed to be from 2015 through 2024) and converted into base-year (2015) present values using 7-percent and 3-percent discount rates. A summary of these estimates is provided in Table 28.[151]

Table 28: Present Value in 2015 of Monetized 2015–2024 Agency Costs for In-House ICT (Millions of 2015 Dollars)

Monetized Cost Component	7-Percent Discount Rate	3-Percent Discount Rate
Policy development/implementation	$80.1	$92.2
Employee training	$53.7	$61.8
Software/Web/audiovisual development	$110.7	$127.3
Software/Web/audiovisual evaluation/testing	$56.6	$65.1
Electronic document creation/remediation	$265.0	$304.8
Total 2015–2014 agency costs for in-house ICT	**$566.1**	**$651.2**

The present value of monetized costs expected to result from implementation of the proposed rule of the Section 508 standards during the 10-year analysis period is estimated at $566 million using a 7-percent discount rate and $651 million using a 3-percent discount rate.

[151] A table showing the estimated costs in each year of the 10-year analysis period is provided in Appendix E.

The estimates in Table 28 and the analysis presented in this section indicate that Federal agencies would incur substantial costs to implement and comply with the proposed ICT accessibility standards.

As noted above, data were not available to quantify some categories of the costs discussed in this section. This is especially true for the costs that may be incurred to ensure that ICT procured by the Federal Government meets the proposed accessibility standards.

9.2. Estimated Cost Increases Associated With Procured ICT

As noted in Section 6.2, the costs agencies incur to purchase compliant ICT were not directly calculated. Similarly, adequate data are not available to estimate the increase in costs to purchase ICT products, services, and content that would comply with the proposed Section 508 standards from Federal contractors and vendors.

However, an estimate of incremental compliance costs associated with procured ICT can be developed as follows:

- The share of total Federal agency ICT procured from contractors and vendors is 48 percent (see Section 6.2.4).
- Federal contractors and vendors were assumed to incur the same percentage increases in the time required for compliance program development and implementation, employee training, development, evaluation, and document creation and repair as Federal agency employees who produce and maintain ICT developed in house.
- The ratio of costs associated with procured and in-house ICT is therefore 0.923 (.48/.52). This ratio was applied to each of the cost estimates shown in Table 27 to obtain estimates of costs for the same category that are associated with procured ICT.

Estimates of the initial and recurring increases in compliance costs for procured ICT developed using this approach are presented in Table 29.

Table 29: Estimates of Increased Costs Associated With Procured ICT (Millions of 2015 Dollars)

Component	Initial Cost	Recurring Cost
Policy development/implementation	$53.2	$5.3
Employee training	$35.6	$3.6
Software/Web/audiovisual development	$30.0	$12.8
Software/Web/audiovisual evaluation/testing	$7.5	$7.5
Electronic document creation/remediation	$63.3	$31.6
Increase in costs for procured ICT	**$189.6**	**$60.8**

The initial increase in compliance costs associated with procured ICT is estimated at $190 million. Recurring annual compliance costs for procured ICT are estimated to be $61 million higher under the proposed Section 508 standards.

Estimates of the 2015 present value of the increase in compliance costs associated with procured ICT during the 10-year analysis period from 2015 through 2024 are presented in Table 30.

Table 30: Present Value in 2015 of Monetized 2015–2024 Costs for Procured ICT (Millions of 2015 Dollars)

Monetized Cost Component	7-Percent Discount Rate	3-Percent Discount Rate
Policy development/implementation	$74.0	$85.1
Employee training	$49.6	$57.0
Software/Web/audiovisual development	$102.2	$117.5
Software/Web/audiovisual evaluation/testing	$52.3	$60.1
Electronic document creation/remediation	$244.6	$281.4
Total 2015–2024 costs for procured ICT	**$522.6**	**$601.1**

The present value of the increased costs during the 10-year analysis period associated with procured ICT is estimated at $523 million using a 7-percent discount rate and $601 million using a 3-percent discount rate.

As noted in Section 6.2, this estimate of projected cost increases does not depend on the extent to which contractors or vendors would be able to pass on some or all of these costs in the form of higher prices charged to Federal agencies for compliant ICT products and services, as both higher purchase costs and lower contractor profits would represent social costs of the proposed Section 508 standards.

9.3. Compliance Costs Associated With Proposed Section 255 Guidelines

As noted in Section 7.2, it is not clear that telecommunications equipment manufacturers would incur costs for supporting RTT on devices with display screens, because these capabilities may be developed and, in some cases, implemented prior to the adoption of a final rule to update the current ICT standards and guidelines.

In addition, significant costs could be incurred to make product support Web site content and the electronic documentation furnished on these sites and through other channels comply with the WCAG 2.0 Level A and Level AA and PDF/UA-1 standards. Based on the review discussed in Section 8.11, several of the largest telecommunications manufacturers appear to have relatively accessible support sections of their public-facing Web sites. However, many others would need to undertake a substantial effort to make the product support sections of their Web sites and the content made available therein accessible. Costs for manufacturers with Section 255 obligations to ensure that their product documentation and support services conform to the proposed guidelines were estimated as follows:

- According to the 2011 Statistics of U.S Business, there were 263 telephone apparatus manufacturers (NAICS 33421), 730 radio and television broadcasting and wireless communications equipment manufacturers (NAICS 33422), and 391 electronic computer manufacturers (NAICS 334111). For this assessment, we assumed that firms with 20 or

more employees have Section 255 obligations under the current FCC regulations. About 16 percent of the firms (217) in this sector had 100 or more employees, and another 20 percent (278) had between 20 and 99 employees.[152] Firms with fewer than 20 employees are less likely than larger firms to provide electronic customer support on their Web sites—in many case because they serve as partners or suppliers to larger firms that offer this support.

- The 25 firms included in our review of telecommunications equipment manufacturer Web support pages (see Section 8.11) were assumed to be representative of the 217 firms with 100 or more employees in this sector. Firms with between 20 and 99 employees were assumed to have substantially less extensive Web support and electronic product documentation that would need to be made accessible under the proposed guidelines.
- Per-firm costs for Web site and electronic content repairs to meet the proposed accessibility guidelines were developed based on estimates presented in the Econometrica regulatory evaluation of the 2013 DOT rule that will require public-facing airline Web sites to be WCAG 2.0 compliant. Estimated one-time costs for airline Web sites ranged from $500,000 for the largest carriers to $50,000 for smaller carriers without online booking capabilities.[153]
- These per-firm estimates were modified to take into account the following considerations:
    - The airline sites reviewed as part of the DOT regulatory evaluation were substantially less accessible than most of the product support sections of the telecommunications equipment manufacturer Web sites reviewed as part of this assessment.
    - Restructuring or repairing the product support section of a Web site (and in some instances, improving the navigation to that section from the home page) should typically require less effort than overhauling an entire Web site. The telecommunications product support sections also do not have the complex interactive functionality that characterizes online air travel booking engines.
- For this preliminary assessment, we assumed that one-time remediation costs for firms with 100 or more employees would average $125,000, or 25 percent of the costs incurred to overhaul a large airline's (largely inaccessible) Web site. Firms with between 20 and 99 employees were assumed to incur an average of $25,000 in one-time costs, or 50 percent of the average for smaller firms without online booking capabilities estimated in the DOT regulatory evaluation.[154]

[152] Census Bureau, "Number of Firms, Number of Establishments, Employment, and Annual Payroll by Enterprise Employment Size for the United States, All Industries: 2011," Statistics of U.S. Businesses.
[153] Econometrica, Inc., "Final Regulatory Analysis on the Final Rule on Accessible Kiosks and Web Sites," October 23, 2013.
[154] The higher percentage of airline Web site accessibility costs assumed for smaller manufacturers takes into account the fact that smaller telecommunications equipment manufacturers would need to provide a full inventory of accessible product support materials even if the product support sections of most of their public-facing Web sites are less extensive and have less functionality than those of the largest manufacturers.

- Providing accessible product documentation and support also entails continuing costs as Web support pages are modified or expanded and as new or updated electronic content is created. The DOT regulatory evaluation estimated that these annual operating and maintenance costs would be equal to 10 percent of the one-time costs for making airline Web sites accessible. Telecommunications and CPE manufacturers typically make large volumes of product documentation and support materials available in electronic form. It would therefore be reasonable to assume that recurring annual costs would represent a larger percentage of the initial one-time costs for firms with Section 255 conformance obligations. For this preliminary analysis, we have assumed that these annually recurring costs average 20 percent of the one-time costs estimated for firms of the same size class.

These data and assumptions were used to develop the preliminary estimates of the costs that would be incurred by telecommunications equipment manufacturers to provide accessible electronic product documentation and Web-based support. These conformance costs were calculated as shown in Table 31.

Table 31: Estimated 2015–2024 Conformance Costs for Manufacturer Web Sites and Content

Cost Calculation Element	100 or More Employees*	20 to 99 Employees*	Total
Total number of firms	**217**	**278**	**495**
Average one-time repair cost per firm	$125,000	$25,000	$68,838
Total one-time costs	**$27,125,000**	**$6,950,000**	**$34,075,000**
Average annual per-firm maintenance cost**	$25,000	$5,000	$13,768
Total annual maintenance costs	**$5,425,000**	**$1,390,000**	**$6,815,000**
Total Web site accessibility costs, 2015–2024			**$92,002,500**
Present value of costs in 2015 (millions)***			$74.18

*Based on the number of NAICS 33421, 33422, and 334111 firms in these size classes, assuming that the largest firms in this sector are those with Section 255 obligations.
**Assumed to be 20 percent of one-time repair costs per firm annually.
***Assumes that half of firms in each size class incur one-time repair costs in 2015 and the remaining firms incur these costs in 2016. Annual maintenance costs begin in 2016 for Web sites made accessible in 2015 and in 2017 for Web sites made accessible in 2016. Present value of costs calculated using a discount rate of 7 percent.

The costs for manufacturers to comply with the proposed Section 255 guidelines relating to electronic product documentation and support are estimated at $17 million in 2015 and $92 million over the 10-year analysis period.

Telecommunications equipment manufacturers may incur additional costs to provide accessible support services, but the extent of these potential cost increases could not be quantified. Information on the nature and extent of these costs is specifically requested in the comments.

9.4. Summary of Monetized and Unquantified Costs of the Proposed Rule

Finally, the costs estimated for in-house ICT (Section 9.1.6), procured ICT (Section 9.2), and telecommunications manufacturers (Section 9.3) were converted to an annualized basis using

discount rates of 7 percent and 3 percent. The annualized costs estimated for the proposed rule are summarized in Table 32.

Table 32: Annualized Compliance Costs for the Proposed Rule, 2015–2024 (Millions of 2015 Dollars)

Monetized Cost Component	7-Percent Discount Rate	3-Percent Discount Rate
Annualized in-house ICT cost	$80.6	$76.3
Annualized cost for procured ICT	$74.4	$70.5
Annualized costs of telecommunications manufacturer product support Web site and content development	$10.6	$9.8
Annualized value of monetized costs	**$165.6**	**$156.6**

Collectively, the proposed revisions to the Section 508 standards and Section 255 guidelines have estimated compliance costs of $165.6 on an annualized basis over the 10-year analysis period using a 7-percent discount rate.

There are also several categories of costs that would result from adoption of the proposed rule that could not be quantified. These costs are listed in Table 33.

Table 33: Unquantified Costs of the Proposed Rule

Possible increase in Federal Government expenditures to provide accommodations if more people with addressable disabilities are hired.
Possible decrease in the amount or variety of electronic content produced to reduce Section 508 compliance obligations.
Costs to develop and produce hardware and telecommunications products that comply with proposed standards.
Costs associated with implementing and supporting RTT on telecommunications devices with text display capabilities.

The impact on computer and telecommunications equipment manufacturers from the proposed rule is particularly difficult to quantify. Information on the impact of the proposed accessibility requirements was solicited in both the 2010 and 2011 ANPRMs and is again in the NPRM and this RIA. Absent this information, it is reasonable to expect that the costs incurred by U.S. and foreign ICT manufacturers to product compliant products for sale in the U.S. market would be lower than the aggregate Section 508 compliance costs estimated for Federal agencies, contractors, and vendors.

It is possible that manufacturers of computer hardware and telecommunications equipment may elect to spread the costs of compliance with the proposed ICT standards and guidelines across all of their entire product lines. The potential impact on consumer prices can be assessed by assuming that these manufacturers would incur compliance costs equal to the entire amount estimated in this analysis for Federal agencies, contractors, and vendors (about $160 million on an annualized basis) with the aggregate value of annual shipments in this sector (about $100 billion). Under this conservative assumption, the incremental compliance costs incurred by

computer and telecommunications equipment would be still less than 0.2 percent of the value of shipments.

9.5. Request for Comment on Cost Estimates for Proposed Rule

1. Would a large number of agency component offices need to revise policies, online resources, and training materials?
    a. Does the current DOJ survey data on Section 508 offices and coordinators provide an adequate basis for projecting additional time required?
    b. Would possibilities for policy/resource consolidation be created because of reference to external standards?
2. Would additional resources be required, or could the expenditures be funded from current Section 508 office/coordinator budgets?
    a. Could the reference to external standards reduce the need to develop customized compliance advice and resources?
    b. Would it be necessary to develop guidance to explain the differences between Section 508 and WCAG 2.0 to a large pool of employees (i.e., not just developers, programmers, and evaluators)?
3. Is the amount of Section 508 training currently provided to Government employees in different occupations adequate for them to comply?
    a. DOJ report: Only Section 508 office/coordinator personnel receive more than 1 hour of training per year.
    b. Other sources recommend higher levels of training for programmers and graphic designers. With adequate training and online resources, can incremental costs of creating, editing, and maintaining various types of compliant electronic content (Web sites, documents, multimedia) be reduced or eliminated?
4. WCAG 2.0 standards are more measurable and testable than those of Section 508. Does this make evaluating compliance:
    a. Take less time, because there is less subjective evaluation and review?
    c. Take more time, because there are more provisions that need evaluation?
    d. Less likely to be undertaken, because it would be easier for third parties to detect and report noncompliance?
    e. More likely to be undertaken, because of the increased likelihood of the evaluation producing usable results?
5. Would the proposed requirements for electronic content result in agencies or contractors providing less electronic content than they would in the absence of the proposed requirements?
    a. If so, please describe what types of electronic content agencies or contractors may choose to not provide due to this rule, and identify which requirement(s) have the greatest effect in terms of reducing electronic content.

b. If this rule would result in less electronic content, are there any changes that could be made to the rule that would minimize the amount of lost content while not substantially reducing the amount of added accessibility?

6. Would telecommunications equipment manufacturers or other entities incur substantial costs to implement support for the proposed RTT standard on the following types of ICT?

   a. End user devices.
   b. Telephone network equipment.
   c. Online video communication software and displays.
   d. End user devices.
   e. Telephone network equipment.
   f. Online video communication software and displays.

7. Would manufacturers and service providers incur fixed or variable costs in addition to those identified by the FCC for implementing SMS-based text to 911 to comply with the proposed RTT requirements? If so, please indicate the scope and nature of these costs and quantify if possible.

8. Are there other categories of Federal employees likely to have responsibility for creating or repairing accessible electronic documents other than the occupational categories listed in Appendix D-3?

   a. If so, what are these additional job categories?

   b. What proportion of employees serving in these new categories would likely have responsibility for creation or remediation of accessible electronic documents?

   c. What proportion of time would persons in each of these new job categories likely spend on creation or remediation of accessible electronic documents?

   d. Are other data available to estimate the costs to create or repair accessible electronic documents by these Federal employees?

10. Conclusion

The preliminary regulatory evaluation indicates that there are substantial benefits and costs associated with the proposed update to the current ICT standards and guidelines. The benefits of this proposed rule that we were able to monetize are estimated at $69.1 million annually over the 10-year analysis period using a 7-percent discount rate and $67.5 million annually using a 3-percent discount rate. The costs of this proposed rule that we were able to monetize are estimated at $165.6 million annually over 10 years using a 7-percent discount rate and $156.6 million using a 3-percent discount rate.

It is important to note, however, that there are important benefits to people with disabilities, Federal agencies, contractors, and vendors for which adequate data were not available to develop monetized estimates. In addition, the benefits of the proposed rule include important, but inherently unquantifiable, national values that are explicitly recognized in Executive Order 13563, including greater social equity, human dignity, and fairness. There are also potentially significant costs that could not be quantified with the available information.

The Access Board and Econometrica have made a preliminary determination that the costs of the proposed update of the Section 508 standards and Section 255 guidelines are justified by the benefits.

Appendix A: ICT Accessibility Standards

W3C finalized the WCAG 1.0 recommendations in May 1999. Shortly thereafter, the Access Board published the current Section 508 standards, which include accessibility requirements for Web sites and other forms of ICT. The W3C standards were updated when the WCAG 2.0 recommendations were published in December 2008. This appendix provides additional information on the evolution of these standards and the areas in which they differ from one another. Additional information is provided on the proposed requirements for software, hardware, and telecommunications equipment, including references to applicable current Federal and consensus standards.

WCAG 1.0 Recommendations

WCAG 1.0 has three priority levels (1 through 3) that correspond to the A, AA, and AAA levels in WCAG 2.0. A substantial portion of the current Section 508 standards for Web sites, and in many instances other forms of ICT, was adopted from the WCAG 1.0 recommendations. A Section 508-compliant Web site could require additional remediation in a few areas (including audio description, dynamic updating of text equivalents, and use of clear language) to meet the WCAG 1.0 Priority 1 recommendations.

Evolution of Current Section 508 Part 22 Standards From WCAG 1.0 Standards

Five provisions in Part 22 of the Section 508 standards do not have close analogs to WCAG 1.0 Priority 1 checkpoints, but they were incorporated in the development of WCAG 2.0. Some Section 508 requirements are similar but not identical to the analogous provisions in WCAG 1.0 (scripting, applets/plug-ins, forms), and others (flicker, navigation bypass) are more specific than their WCAG 1.0 counterparts. Only one Section 508 requirement (the need to provide users with adequate time to respond when a timed response is required) was not addressed at all in the WCAG 1.0 Priority 1 recommendations.[155]

Evolution of WCAG 2.0 Success Criteria From Current Section 508 Part 22 Standards

New technologies, techniques, and accessibility issues have emerged since the current Section 508 standards were published. The NPRM explains the evolution of WCAG 2.0 from the current Section 508 standards:

> WCAG 2.0 standardizes best practices that were developed in response to requirements of the current 508 Standards.... Where a WCAG 2.0 success criterion is new and does not correspond to a current 508 provision, it addresses what has come to be regarded by the WCAG developers as a deficiency in the current 508 Standards. In most cases, agencies with 508 testing processes have adapted their procedures to address these accessibility concerns.

The NPRM identifies new requirements in WCAG 2.0 that address specific gaps in the current Section 508 standards, including a requirement for a logical reading order, the ability to resize text, the ability to turn off background audio that might interfere with comprehension, and compatibility with screen reading software.

[155] JimThatcher.com provides a provision-by-provision comparison and discussion of the Section 508 and WCAG 1.0 Priority 1 provisions in "Side by Side WCAG vs. 508."

One important aspect of the WCAG 2.0 standards is that they are generally more testable than those in Section 508 or WCAG 1.0 because WCAG 2.0 establishes a set of success criteria for defining conformance to the WCAG 2.0 standards. WCAG 2.0 success criteria are written as testable statements that are not technology specific. Consequently, Federal employees, contractors, and vendors would be able to conduct more specific testing and evaluation of the products, services, and content they create or modify than is the case under the current standards.

A.1. WCAG 2.0 Level A and Level AA Success Criteria

WCAG 2.0 Level A success criteria provide a minimal level of accessibility without necessarily requiring any changes in the underlying design of the ICT. Implementing the Level AA success criteria may require changes in design or programming but will afford more complete accessibility to users with various types of disabilities. Table A-1 lists WCAG 2.0 Level A and Level AA success criteria and describes what is required to ensure that each criterion is satisfied in the context of an HTML-coded Web site.

Table A-1: WCAG 2.0 Level A and Level AA Success Criteria

Guideline	Heading	Level	508 Reference	Description
1.1.1	Non-Text Content	A	1194.22(a)	All images, form image buttons, and image map hot spots have appropriate, equivalent alternative text. Embedded multimedia is identified via accessible text.
1.2.1	Prerecorded Audio-Only and Video-Only	A	1194.22(a)	A descriptive text transcript is provided for non-live, Web-based audio. A text or audio description is provided for non-live, Web-based video-only.
1.2.2	Captions (Prerecorded)	A	1194.22(b) and .24(c)	Synchronized captions are provided for non-live, Web-based video (YouTube videos, etc.).
1.2.3	Audio Description or Media Alternative (Prerecorded)	A	1194.22(b) and .24(d)	A descriptive text transcript OR audio description audio track is provided for non-live, Web-based video.
1.2.4	Captions (Live)	AA	1194.22(b) and .24(c)	Synchronized captions are provided for all live multimedia that contains audio (audio-only broadcasts, webcasts, video conferences, Flash animations, etc.).
1.2.5	Audio Description (Prerecorded)	AA	1194.22(b) and .24(d)	Audio descriptions are provided for all video content. NOTE: Only required if the video conveys content visually that is not available in the default audio track.
1.3.1	Information and Relationships	A	1194.22(e) through (h)	Semantic markup is used to designate headings, lists, and emphasized or special text. Tables are used for tabular data. Where necessary, data cells are associated with their headers. Table captions and summaries are used where appropriate.
1.3.2	Meaningful Sequence	A	New	The reading and navigation order (determined by code order) is logical and intuitive.

Guideline	Heading	Level	508 Reference	Description
1.3.3	Sensory Characteristics	A	New	Instructions do not rely on shape, size, or visual location (e.g., “Click the square icon to continue” or “Instructions are in the right-hand column”).
1.4.1	Use of Color	A	1194.22(c) and .21(i)	Color is not used as the sole method of conveying content or distinguishing visual elements.
1.4.2	Audio Control	A	New	A mechanism is provided to stop, pause, mute, or adjust volume for audio that automatically plays on a page for more than 3 seconds.
1.4.3	Contrast (Minimum)	AA	New	Text and images of text have a contrast ratio of at least 4.5:1. Large text (over 18 point or 14 point bold) has a contrast ratio of at least 3:1.
1.4.4	Resize Text	AA	New	The page is readable and functional when the text size is doubled.
1.4.5	Images of Text	AA	1194.21(f)	If the same visual presentation can be made using text alone, an image is not used to present that text.
2.1.1	Keyboard	A	1194.21(a)	All page functionality is available using the keyboard, unless the functionality cannot be accomplished in any known way using a keyboard.
2.1.2	No Keyboard Trap	A	New	Keyboard focus is never locked or trapped at one particular page element. The user can navigate to and from all navigable page elements using only a keyboard. Page-specified shortcut keys do not conflict with existing browser and screen reader shortcuts.
2.2.1	Timing Adjustable	A	1194.22(p)	If a page or application has a time limit, the user is given options to turn off, adjust, or extend that time limit. This is not a requirement for real-time events (e.g., an auction), where the time limit is absolutely required, or if the time limit is longer than 20 hours.
2.2.2	Pause, Stop, Hide	A	1194.21(h)	Automatically moving, blinking, or scrolling content that lasts longer than 5 seconds can be paused, stopped, or hidden by the user. Automatically updating content can be paused, stopped, or hidden by the user, or the user can manually control the timing of the updates.
2.3.1	Three Flashes or Below Threshold	A	1194.21(k) and .22(j)	No page content flashes more than three times per second unless that flashing content is sufficiently small and the flashes are of low contrast and do not contain too much red. (See general flash and red flash thresholds.)
2.4.1	Bypass Blocks	A	1194.22(o)	A link is provided to skip navigation and other page elements that are repeated across Web pages.
2.4.2	Page Title	A	1194.22(i)	The Web page has a descriptive and informative page title.
2.4.3	Focus Order	A	New	The navigation order of links, form elements, etc., is logical and intuitive.

Guideline	Heading	Level	508 Reference	Description
2.4.4	Link Purpose (In Context)	A	New	The purpose of each link (or form image button or image map hot spot) can be determined from the link text alone or from the link text and its context (e.g., surrounding paragraph, list item, table cell, or table headers).
2.4.5	Multiple Ways	AA	New	Multiple ways are available to find other Web pages on the site—at least two of a list of related pages, table of contents, site map, site search, or list of all available Web pages.
2.4.6	Headings and Labels	AA	New	Page headings and labels for form and interactive controls are informative. Avoid duplicating heading (e.g., “More Details”) or label text (e.g., “First Name”) unless the structure provides adequate differentiation between them.
2.4.7	Focus Visible	AA	1194.21(c)	It is visually apparent which page element has the current keyboard focus (i.e., as you tab through the page, you can see where you are).
3.1.1	Language of Page	A	New	The language of the page is identified using the HTML lang attribute.
3.1.2	Language of Parts	AA	New	The language of page content that is in a different language is identified.
3.2.1	On Focus	A	1194.21(l) and .22(n)	When a page element receives focus, it does not result in a substantial change to the page, the spawning of a pop-up window, an additional change of keyboard focus, or any other change that could confuse or disorient the user.
3.2.2	On Input	A	1194.21(l) and .22(n)	When a user inputs information or interacts with a control, it does not result in a substantial change to the page, the spawning of a pop-up window, an additional change of keyboard focus, or any other change that could confuse or disorient the user unless the user is informed of the change ahead of time.
3.2.3	Consistent Navigation	AA	New	Navigation links that are repeated on Web pages do not change order when navigating through the site.
3.2.4	Consistent Identification	AA	1194.22(e)	Elements that have the same functionality across multiple Web pages are consistently identified. For example, a search box at the top of the site should always be labeled the same way.
3.3.1	Error Identification	A	1194.21(l) and .22(n)	Required form elements or form elements that require a specific format, value, or length provide this information within the element’s label or within the element’s title attribute. If utilized, form validation errors are presented in an efficient, intuitive, and accessible manner.
3.3.2	Labels or Instructions	A	1194.21(l) and .22(n)	Sufficient labels, cues, and instructions for required interactive elements are provided via instructions, examples, properly positioned form labels, and/or fieldsets/legends.

Guideline	Heading	Level	508 Reference	Description
3.3.3	Error Suggestion	AA	New	If an input error is detected (via client-side or server-side validation), provide suggestions for fixing the input in a timely and accessible manner.
3.3.4	Error Prevention (Legal, Financial, Data)	AA	New	If the user can change or delete legal, financial, or test data, the changes/deletions can be reversed, verified, or confirmed.
4.1.1	Parsing	A	New	Significant HTML/XHTML validation/parsing errors are avoided.
4.1.2	Name, Role, Value	A	1194.21(d)	Markup is used in a way that facilitates accessibility. This includes following the HTML/XHTML specifications and using forms, form labels, frame titles, etc., appropriately.

Source: Adapted from WebAIM.org WCAG 2.0 checklist for HTML documents. Section 508 references are from Access Board staff standards comparison table referenced in the NPRM.

A.1.2. Application of WCAG 2.0 Success Criteria to Non-Web ICT

The WCAG2ICT Task Force evaluated how each WCAG 2.0 success criterion would apply in the context of certain types of non-Web ICT and developed guidance to assist developers in applying the WCAG 2.0 recommendations to ensure the accessibility of non-Web documents and software. The task force found that the majority of success criteria from WCAG 2.0 can apply to non-Web documents and software with no or only minimal changes: [156]

- Of the 38 Level A and Level AA success criteria, 26 did not include any Web-related terms and apply directly as written and as described in the "Intent" sections from the updated "Understanding WCAG 2.0."
- Of the remaining 12 success criteria, the task force found that 8 of them apply as written when replacing certain Web-specific terms or phrases such as "Web page(s)" with non-Web terms or phrases such as "non-Web document(s) and software" or "for non-Web documents and software that use markup languages, in such a way that…," etc.
- The remaining four success criteria apply in situations when "a set of Web pages" or "multiple Web pages" share some characteristic or behavior. For these, the task force found that (with substitutions) the success criteria apply to non-Web documents fairly straightforwardly. However, no guidance has been developed to assist in applying these four standards to non-Web software.

The proposed requirements for one specific type of electronic documents—those stored in PDF—would be established by referencing the applicable ISO standard. PDF/UA-1 provides a

[156] W3C, "Guidance on Applying WCAG 2.0 to Non-Web Information and Communications Technologies," Working Draft, December 13, 2012. The task force noted that this guidance was required because, "while WCAG 2.0 was designed to be technology neutral, it assumes the presence of a 'user agent' such as a browser, media player, or assistive technology as a means to access Web content. Therefore, the application of WCAG 2.0 to documents and software in non-Web contexts required some interpretation in order to determine how the intent of each WCAG 2.0 success criterion could be met in these different contexts of use."

technical, interoperable standard for the authoring, remediation, and validation of PDF content.[157]

A.2. Additional Proposed Requirements for Software and Applications

The proposed rule includes three sets of additional specific requirements for certain types of software and applications: interoperability with assistive technology, non-Web software applications, and authoring tools.[158] As Table A-2 shows, many of these requirements are based on WCAG 2.0 success criteria.

Table A-2: Proposed Requirements for Software

Proposed Reference	Heading	508 Reference	WCAG 2.0 Reference	Requirement Stated in Reference
CHAPTER 5: SOFTWARE				
502 Interoperability with Assistive Technology				
502.2	Documented Accessibility Features	1194.21(b)	None	Applications shall not disrupt or disable activated features of other products or operating systems that are identified as accessibility features, where those features are developed and documented according to industry standards.
502.3	Accessibility Services	New (current practice)	None	Platforms (such as operating systems) would be required to provide a documented set of accessibility services, usually referred to as Application Programming Interfaces (APIs).
502.3.1	Object Information	Expanded from 1194.21(d) (current practice)	4.1.2	For all user interface components, the name and role can be programmatically determined; states, properties, and values that can be set by the user can be programmatically set; and notification of changes to these items is available to user agents, including assistive technologies.
502.3.2	Row, Column, and Headers	1194.22(g) and (h)	1.3.1	Row and column headers shall be identified for data tables. Markup shall be used to associate data cells and header cells for data tables that have two or more logical levels of row or column headers.
502.3.3	Values	1194.21(d) (current practice)	4.1.2	For all user interface components, the name and role can be programmatically determined; states, properties, and values that can be set by the user can be programmatically set; and notification of changes to these items is available to user agents, including assistive technologies.
502.3.4	Label Relationships	1194.21(l) and .22(n)	1.3.1	Row and column headers shall be identified for data tables. Markup shall be used to associate data cells and header cells for data tables that have two or more logical levels of row or column headers.

[157] ISO 14289-1 (2012), Document Management Applications—Electronic Document File Format Enhancement for Accessibility—Part 1: Use of ISO 32000-1 (PDF/UA-1).

[158] Web applications that conform to all Level A and Level AA Success Criteria and all Conformance Requirements in WCAG 2.0 would not be required to conform to the provisions that address interoperability with AT and requirements for applications.

Proposed Reference	Heading	508 Reference	WCAG 2.0 Reference	Requirement Stated in Reference
502.3.5	Hierarchical Relationships	1194.21(l) and .22(n)	1.3.1, 3.3.1, 3.3.2	When electronic forms are used, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.
502.3.6	Text	1194.21(f)	1.4.5	Textual information shall be provided through operating system functions for displaying text. The minimum information that shall be made available is text content, text input caret location, and text attributes.
502.3.7	Actions	New (current practice)	None	A list of all actions that can be executed on a programmatic object would have to be programmatically determinable and that software allows assistive technology to programmatically execute available actions on objects.
502.3.8	Focus Cursor	1194.21(c)	2.4.7	A well-defined onscreen indication of the current focus shall be provided that moves among interactive interface elements as the input focus changes. The focus shall be programmatically exposed so that assistive technology can track focus and focus changes.
502.3.9	Event Notification	1194.21(d) (current practice)	None	Programmatic notification of events relevant to user interactions, including but not limited to changes in the component's state, value, name, description, or boundary, would need to be available to assistive technologies.
502.4	Platform Accessibility Features	ANSI/ HFES 200	None	Specifies requirements for core accessibility features available in platforms (harmonized with accepted industry practices).
503 Applications				
503.2	User Preferences	1194.21(g)	New	Applications shall not override user-selected contrast and color selections and other individual display attributes.
503.3	Alternative User Interfaces	New	New	Software that functions as assistive technology would be required to use platform accessibility services.
503.4	User Controls for Captions and Audio Description	New	New	Controls for captions and audio description would be required and would have to be provided at the same menu level as those used for volume control or channel selection.
504 Authoring Tools				
504.2	Content Creation or Editing	New	ATAG 2.0 (expected)*	Authoring tools would be required to include at least one mode of operation to create or edit content that would conform to WCAG 2.0 Success Criteria for features and formats supported by the authoring tool.
504.2.1	Preservation of Information Provided for Accessibility in Format Conversion	1194.23(j)	ATAG 2.0 (expected)*	When converting one format to another, authoring tools would be required to preserve the information required for accessibility to the extent that it is supported by the destination format.

Proposed Reference	Heading	508 Reference	WCAG 2.0 Reference	Requirement Stated in Reference
504.3	Prompts	New	ATAG 2.0 (expected)*	Authoring tools would be required to include a feature to provide prompts that proactively support the creation of accessible content.
504.4	Templates	New	ATAG 2.0 (expected)*	Where templates are provided, authoring tools would be required to provide a range of templates that facilitate accessible content creation.

*W3C, ATAG, version 2.0, currently in draft form.[159]
Source: Econometrica, Inc., compilation from NPRM section-by-section analysis.

A.3. Proposed Requirements for Hardware and Telecommunications Equipment

The application of WCAG 2.0 to computers, copiers, scanners, telecommunications equipment, and other types of ICT hardware is not as straightforward. The proposed standards for hardware and telecommunications equipment includes several requirements from the ADA and Architectural Barriers Act Accessibility Guidelines (36 CFR Part 1191, Appendix D, Section 707), as well as requirements recommended by the TEITAC for ICT that provides two-way voice communication. A summary of the proposed requirements for hardware and telecommunication equipment is provided in Table A-3.

[159] W3C ATAG version 1.0 was approved in February 2000. ATAG 2.0 is being developed to be compatible with WCAG 2.0. The W3C WAI anticipates ATAG 2.0 will be completed in 2014.

Table A-3: Proposed Requirements for Hardware and Telecommunications Equipment

Proposed Reference	Heading	508 Reference	255 Reference	707 Reference	Requirement Stated in Reference
CHAPTER 4: HARDWARE					
402 Closed Functionality					
402.1	General	1194.25(a)	*Excepted		Products with closed functionality shall be usable by people with disabilities without requiring an end user to attach assistive technology to the product. Personal headsets for private listening are not assistive technology.
402.2	Speech Output Enabled	New	*Excepted	707.5	Machines shall be speech enabled. Operating instructions and orientation, visible transaction prompts, user input verification, error messages, and all displayed information for full use shall be accessible to and independently usable by individuals with vision impairments. Speech shall be delivered through a mechanism that is readily available to all users. Speech shall be recorded or digitized human or synthesized.
402.2.1	User Control	1194.25(e)	*Excepted	707.5.1	Speech shall be capable of being repeated or interrupted.
402.2.2	Braille Instructions	New	*Excepted	707.8	Braille instructions for initiating the speech mode shall be provided.

Proposed Reference	Heading	508 Reference	255 Reference	707 Reference	Requirement Stated in Reference
402.3.1	Private Listening	1194.25(e)	*Excepted		When products provide auditory output, the audio signal shall be provided at a standard signal level through an industry standard connector that will allow for private listening. The product must provide the ability to interrupt, pause, and restart the audio at any time.
402.3.2	Non-Private Listening	1194.25(f) and .23(g)	*Excepted		When products provide non-private listening, incremental volume control shall be provided with output amplification up to a level of at least 65 dB. Where the ambient noise level of the environment is above 45 dB, a volume gain of at least 20 dB above the ambient level shall be user selectable. A function shall be provided to automatically reset the volume to the default level after every use.

Proposed Reference	Heading	508 Reference	255 Reference	707 Reference	Requirement Stated in Reference
402.4	Characters	New	*Excepted	707.7.2	Characters displayed on the screen shall be in a sans serif font. Characters shall be 3/16-inch (4.8 mm) high minimum based on the uppercase letter "I." Characters shall contrast with their background with either light characters on a dark background or dark characters on a light background.
403 Biometrics					
403.1	General	1194.25(d) and .26(c)	New		When biometric forms of user identification or control are used, an alternative form of identification or activation, which does not require the user to possess particular biological characteristics, shall also be provided.

Proposed Reference	Heading	508 Reference	255 Reference	707 Reference	Requirement Stated in Reference
404 Preservation of Information Provided for Accessibility					
404.1	General	1194.23(j)	1193.37		Products that transmit or conduct information or communication shall pass through cross-manufacturer, non-proprietary, industry-standard codes, translation protocols, formats, or other information necessary to provide the information or communication in a usable format. Technologies that use encoding, signal compression, format transformation, or similar techniques shall not remove information needed for access or shall restore it upon delivery.
405 Flashing					
405.1	General	1194.25(i)	1193.43(f)		Products shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.
406 Standard Connections					
406.1	General	1194.26(d)	1193.51(a)		Where provided, at least one of each type of expansion slots, ports, and connectors shall comply with publicly available industry standards.
407 Operable Parts					
407.1	General	Not stated	1193.41(a), (f)	707.3	Unless a clear or correct key is provided, each operable part shall be able to be differentiated by sound or touch, without activation.

Proposed Reference	Heading	508 Reference	255 Reference	707 Reference	Requirement Stated in Reference
407.2	Contrast	New	New	707.6.3.1	Function keys shall contrast visually from background surfaces. Characters and symbols on key surfaces shall contrast visually from key surfaces. Visual contrast shall be either light on dark or dark on light.
407.3.1	Tactilely Discernible and Identification	1194.23(k)(1)	New	707.6.1	At least one tactilely discernible input control shall be provided for each function. Input controls shall be tactilely discernible without activation and operable by touch. Where provided, key surfaces outside active areas of display screens shall be raised above surrounding surfaces.
407.3.2	Alphabetic Keys	New (industry standard)	New (industry standard)		Alphabetic keys shall be arranged in a QWERTY keyboard layout. The “F” and “J” keys shall be tactilely distinct from the other keys.
407.3.3	Numeric Keys	New (industry standard)	New (industry standard)	707.6.2	Numeric keys shall be arranged in a 12-key ascending or descending telephone keypad layout. The number five key shall be tactilely distinct from the other keys.
407.4	Key Repeat	1194.23(k)(3)	New		If key repeat is supported, the delay before repeat shall be adjustable to at least 2 seconds. Key repeat rate shall be adjustable to 2 seconds per character.

Proposed Reference	Heading	508 Reference	255 Reference	707 Reference	Requirement Stated in Reference
407.5	Timed Response	1194.25(b) and .23(d)	1193.41(g)		When a timed response is required, the user shall be alerted and given sufficient time to indicate more time is required.
407.6	Status Indicators	1194.23(k)(4)	New		The status of all locking or toggle controls or keys shall be visually discernible and discernible either through touch or sound.
407.7	Color	1194.25(g)	1193.41(c)		Color coding shall not be used as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.
407.8	Audio Signaling	New	New		Audio signaling cannot be the only means of conveying information, indicating an action, or prompting a response.
407.9	Operation	1194.23(k)(2)	1193.41(e) and .41(f)	707.3	Controls and keys shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls and keys shall be 5 lbs. (22.2 N) maximum.
407.10	Privacy	New	New	707.4	Machines shall provide the opportunity for the same degree of privacy of input and output available to all individuals.

Proposed Reference	Heading	508 Reference	255 Reference	707 Reference	Requirement Stated in Reference
407.11	Keys, Tickets, and Fare Cards	New	*Excepted	707.1-A	If fare cards have one tactually distinctive corner, they can be inserted with greater accuracy. Token collection devices that are designed to accommodate tokens that are perforated can allow a person to distinguish more readily between tokens and coins.
407.12	Reach Height	1194.25(j)(1)–(j)(4) (partial)	*Excepted		At least one of each type of operable part of stationary ICT must be accessible by side or forward reaches, relative to a specified vertical reference plane.
408 Display Screens					
408	General	New	*Excepted	707.7.1	The display screen shall be visible from a point located 40 inches (1015 mm) above the center of the clear floor space in front of the machine.
409 Transactional Outputs					
409	General	New	*Excepted	707.5.2	Where transactional outputs are provided by ICT with speech output, speech output shall audibly provide information necessary to complete or verify the transaction.

Proposed Reference	Heading	508 Reference	255 Reference	707 Reference	Requirement Stated in Reference
410 ICT With Two-Way Voice Communication					
410.2	Volume Gain	1194.23(f)	1193.43(e)		Volume gain shall be provided and would also require the volume control to conform to the requirements of 47 CFR 68.317, "Hearing Aid Compatibility Volume Control: Technical Standards."
410.3	Magnetic Coupling	1194.23(h)	1193.43(i)		Where ICT delivers output by an audio transducer that is typically held up to the ear, ICT shall provide a means for effective magnetic wireless coupling to hearing technologies.
410.4	Minimize Interference	1194.23(i)	1193.43(h)		Interference with hearing technologies (including hearing aids, cochlear implants, and assistive listening devices) shall be reduced to the lowest possible level.
410.5	Digitally Encoded Speech	New (industry standard)	New (industry standard)		ICT shall transmit and receive speech that is digitally encoded in the manner specified by ITU-T Recommendation G.722 for encoding and storing audio information.
410.6	Real-Time Text Functionality	New	New		Wherever ICT provides real-time voice communication, ICT shall also support real-time text functionality.

Proposed Reference	Heading	508 Reference	255 Reference	707 Reference	Requirement Stated in Reference
410.7	Caller ID	1194.23(e)	New		Where provided, caller identification and similar telecommunications functions shall be available in text or audio form.
410.8	Video Communication	New	New		Where ICT provides two-way voice communication that includes real-time video functionality, the quality of the video shall be sufficient to support communication using sign language.
411 Closed Caption Processing Technologies					
411	General	1194.24(a)	1193.37		Where players and displays process video with synchronized audio, they must decode closed-caption data and display captions. Where players and ancillary equipment process video with synchronized audio, cabling would be required to pass-through caption data.
412 Audio Description Processing Technology					
412	General	1194.24(b)	New		Where ICT displays or processes video with synchronized audio, ICT shall provide a mode of operation that plays associated audio description.
413 User Controls for Captions and Audio Description					
413.1.1	Caption Controls	New	*Excepted		User controls for captioning shall be comparable in prominence to the location of user controls for volume where ICT displays video with synchronized audio.

Proposed Reference	Heading	508 Reference	255 Reference	707 Reference	Requirement Stated in Reference
413.1.2	Audio Description Controls	New	*Excepted		User controls for the selection of audio description shall be comparable in prominence to the location of user controls for program selection.

*ICT components covered under Sec. C201.1 would not have to comply with this proposed requirement.
Source: Econometrica, Inc., compilation from NPRM section-by-section analysis.

A.4. Proposed Requirements for Support Documentation and Services

Finally, the Access Board is proposing to revise and expand the current accessibility requirements for ICT support documentation and services. These provisions are listed in Table A-4.

Table A-4: Proposed Accessibility Requirements for Support Documentation and Services

Proposed Reference	Heading	508 Reference	255 Reference	Requirement Stated in Reference
CHAPTER 6: SUPPORT DOCUMENTATION AND SERVICES				
602 Support Documentation				
602.2	Accessibility and Compatibility Features	1194.41(b)	1193.33	Documentation would be required to list and explain how to use the compatibility features of ICT that support the technical requirements of this document. Documentation would be required to include information on accessibility features that are built in to ICT and ICT accessibility features that provide compatibility with assistive technology.
602.3	Electronic Support Documentation	New	New	Documentation in electronic format, including Web-based self-service support, would be required to conform to all Level A and Level AA Success Criteria and all Conformance Requirements in WCAG 2.0 or to ISO 14289-1 (PDF/UA-1).
602.4	Alternative Formats for Non-Electronic Support Documentation	1194.41(a)	1193.33(a)(2)	Documentation that is not in electronic format would have to be provided in alternate formats usable by individuals who are blind or have low vision, upon request.
603 Support Services				
603.2	Information on Accessibility and Communication Features	New	1193.33(a)(3)	ICT support services would be required to include information on ICT accessibility and compatibility features of ICT.

Proposed Reference	Heading	508 Reference	255 Reference	Requirement Stated in Reference
603.3	Accommodation of Communication Needs	1194.41(c)	1193.33	ICT support services would be required to accommodate the communication needs of individuals with disabilities. When support services provide documentation, the documentation provided is required to be accessible.

Source: Econometrica, Inc., compilation from NPRM section-by-section analysis.

A.5. Mapping of Proposed Rule Provisions to People With Specific Types of Disabilities

Table A-5 identifies the specific provisions in the proposed Rule that would benefit people with the following specific types of disabilities:

- Blind: Person with significant vision impairment who prefers to use a non-visual interface.
- LV (low vision): Person with significant vision impairment, but who prefers to use a visual interface when available.
- Deaf: Person who prefers to use a non-auditory interface.
- HoH (Hard of Hearing): Person with a significant hearing impairment, but who prefers to use an auditory interface when available.
- Motor: Person with limited manual dexterity, reach range (including someone using a wheelchair), or strength.
- Speech: Person limited on their ability to speak clearly.
- CLL (Cognitive, Language, and learning): Person with limited ability to process, understand, or comprehend information.
- Photo (Photosensitivity): Person who is susceptible to visually induced seizures.

Table A-5: Proposed Rule Provisions Benefitting People With Specific Types of Disabilities

Provision Number and Title	Blind	LV	Deaf	HoH	Motor	Speech	CLL	Photo
301 General, **302 Functional Performance Criteria**	X	X	X	X	X	X		
302.1 Without Vision	X							
302.2 With Limited Vision		X						
302.3 Without Perception of Color		X						
302.4 Without Hearing			X					
302.5 With Limited Hearing				X				
302.6 Without Speech						X		
302.7 With Limited Manipulation					X			
302.8 With Limited Reach and Strength					X			

Provision Number and Title	Blind	LV	Deaf	HoH	Motor	Speech	CLL	Photo
402 Closed Functionality, 402.1 General, 402.2 Speech-Output Enabled	X	X					X	
402.2.1 User Control	X	X					X	
402.2.2 Braille Instructions	X							
402.3 Volume				X				
402.3.1 Private Listening	X			X				
402.3.2 Non-Private Listening	X			X				
402.4 Characters		X						
403 Biometrics, 403.1 General	X				X	X		
404 Preservation of Information Provided for Accessibility, 404.1 General	X		X	X	X		X	
405 Flashing, 405.1 General								X
406 Standard Connections, 406.1 General	X			X	X			
407 Operable Parts, 407.1 General	X	X	X	X	X		X	
407.2 Contrast		X						
407.3 Tactilely Discernible (and sub-provisions)	X							
407.4 Key Repeat					X			
407.5 Timed Response	X	X			X		X	
407.6 Status Indicators	X							
407.7 Color		X					X	
407.8 Audio Signaling			X	X				
407.9 Operation					X			
407.10 Privacy	X	X						
407.11 Keys, Tickets, and Fare Cards	X							
407.12 Reach Height (and sub-provisions)					X			
408 Display Screens, 408.1 General					X			
409 Transactional Outputs, 409.1 General	X							
410 ICT With Two-Way Voice Communication, 410.1 General	X		X	X	X			
410.2 Volume Gain				X				
410.3 Magnetic Coupling				X				
410.4 Minimize Interference (includes sub-provisions)				X				
410.5 Digitally Encoded Speech				X				
410.6 Real-Time Text Functionality (includes sub-provisions)			X	X		X		
410.7 Caller ID	X	X	X	X				
410.8 Video Communication			X					

Provision Number and Title	Blind	LV	Deaf	HoH	Motor	Speech	CLL	Photo
411 Caption Processing Technologies, 411.1 General (includes sub-provisions)			X	X				
412 Audio Description Processing Technology, 412.1 General (includes sub-provisions)	X							
413 User Controls for Captions and Audio Description, 413.1 General (includes sub-provisions)	X		X	X				
502 Interoperability With Assistive Technology, 502.1 General	X	X	X	X	X		X	
502.2 Documented Accessibility Features (includes sub-provisions)	X		X	X	X			
502.3 Accessibility Services (includes sub-provisions)	X				X			
502.4 Platform Accessibility Features	X	X	X	X	X		X	
Section 9.3.3 Enable sequential entry of multiple (chorded) keystrokes					X			
Section 9.3.4 Provide adjustment of delay before key acceptance					X			
Section 9.3.5 Provide adjustment of same-key double-strike acceptance					X			
Section 10.6.7 Allow users to choose visual alternative for audio output			X	X				
Section 10.6.8 Synchronize audio equivalents for visual events		X		X			X	
Section 10.6.9 Provide speech output services	X	X				X	X	
Section 10.7.1 Display any captions provided			X	X				
503 Applications, 503.1 General	X	X	X	X	X			
503.2 User Preferences		X						
503.3 Alternative User Interfaces	X				X			
503.4 User Controls for Captions and Audio Description (includes sub-provisions)	X		X	X				
504 Authoring Tools, 504.1 General	X	X	X	X				
504.2 Content Creation or Editing	X	X	X	X				
504.2.1 Preservation of Information Provided for Accessibility in Format Conversion	X		X	X				
504.3 Prompts	X	X	X	X				
504.4 Templates	X	X	X	X				

Source: U.S. Access Board.

Appendix B: Data on People With Disabilities

This section provides information on people with disabilities who could potentially benefit from the proposed update of the current Section 508 standards and Section 255 guidelines.

B.1. Extent and Severity of Disabilities in the U.S. Population

Information on the extent and severity of disabilities in the U.S. population is available from a variety of Government data sources. The most recent SIPP provides estimates of the proportion of the U.S. civilian noninstitutional population in selected age groups who have hearing, vision, or ambulatory disabilities. Additional questions provide data on use of hearing aids and wheelchairs.[160] These data can be used to develop estimates of the numbers of people with disabilities that could be addressed by ICT accessibility standards. These data were used to develop estimates of the population of people with disabilities who would potentially benefit from various updated ICT standards (people with "addressable disabilities"). Selected results from the 2010 SIPP data are presented in Table B-1.[161]

[160] The SIPP is a household-based survey designed as a continuous series of national panels. Each panel features a nationally representative sample interviewed over a multiyear period lasting approximately 4 years. Functional disability questions were administered from May through August 2010 in Wave 6 of the 2008 SIPP panel. Severe difficulty seeing is defined as "not able to see the words and letters in ordinary newspaper print at all."

[161] The estimate of people with "difficulty hearing" includes severe difficulty hearing (1.1 million), non-severe hearing (6.5 million), and used a hearing aid–no hearing difficulty (3.4 million). This is because the SIPP report cited above does include people who provide responses of "yes" to the question "Do you use a hearing aid?" and "no" to the question "Do you have difficulty hearing what is said in a normal conversation ... when wearing your hearing aid?" in the disability totals on Table A-1; they are only listed under the category "used a hearing aid–no difficulty hearing." We have included them in the estimate of people with difficulty hearing because many of the proposed requirements—in Section 255 in particular—are directed at assisting persons who use hearing aids using ICT equipment, which often pose accessibility problems that are different than hearing normal conversation in person.

Table B-1: U.S. Population With Addressable Disabilities, 2010

	Age 15–64		Age 65 and over		Age 15 and over	
Nature of Disability	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Difficulty seeing	**4,295,000**	**2.1%**	**3,782,000**	**9.8%**	**8,077,000**	**3.3%**
Severe	960,000	0.5%	1,050,000	2.7%	2,010,000	0.8%
Not severe	3,336,000	1.6%	2,731,000	7.1%	6,067,000	2.5%
Difficulty hearing	**4,308,000**	**2.1%**	**6,642,000**	**17.2%**	**10,950,000**	**4.5%**
Severe	430,000	0.2%	666,000	1.7%	1,096,000	0.5%
Not severe	2,990,000	1.5%	3,485,000	9.0%	6,475,000	2.7%
Corrected with hearing aid*	888,000	0.4%	2,491,000	6.5%	3,379,000	1.4%
Difficulty with speech	**1,975,000**	**1.0%**	**843,000**	**2.2%**	**2,818,000**	**1.2%**
Severe	365,000	0.2%	158,000	0.4%	523,000	0.2%
Not severe	1,610,000	0.8%	685,000	1.8%	2,295,000	0.9%
Adjustment for people with multiple seeing, hearing, and speech difficulties**	**-1,675,000**	**-0.8%**	**-1,867,000**	**-4.8%**	**-3,542,000**	**-1.5%**
Severe	-172,000	-0.1%	-169,000	-0.4%	-341,000	-0.1%
Not severe	-1,503,000	-0.7%	-1,698,000	-4.4%	-3,201,000	-1.3%
Mobility impairment-used a wheelchair	**1,623,000**	**0.8%**	**2,014,000**	**5.2%**	**3,637,000**	**1.5%**
Difficulty grasping	**3,837,000**	**1.9%**	**2,875,000**	**7.4%**	**6,712,000**	**2.8%**
Severe	559,000	0.3%	334,000	0.9%	893,000	0.4%
Not severe	3,278,000	1.6%	2,541,000	6.6%	5,819,000	2.4%
People with ICT-addressable disabilities***	**14,363,000**	**7.1%**	**14,289,000**	**37.0%**	**28,652,000**	**11.9%**
Total U.S. population	203,083,000		38,599,000		241,682,000	
Percent of total U.S. population	7.1%		37.0%		11.9%	

*Net of people also included in estimates of people with severe or not severe difficulty hearing estimates.
**Required to avoid double counting of people with multiple seeing, hearing, and speech disabilities.
***Difficulty seeing, difficulty hearing, difficulty with speech, used a wheelchair, or difficulty grasping.
Source: Census Bureau, Americans With Disabilities: 2010, P70-131, Table A-1.

Based on the 2010 SIPP data, about 8.1 million people age 15 or older have difficulty seeing even when using glasses or contact lenses, and 11.0 million people age 15 or older have difficulty hearing normal conversations or use a hearing aid to be able to hear normal conversations. Overall, about 14.4 million people age 15 to 64 and 14.3 million people age 65 and over in 2010 had disabilities that can potentially be addressed by ICT accessibility requirements. In addition, the numbers of people with addressable disabilities can be expected to increase in the next decade as the U.S. population ages.

It is important to note that these SIPP-based estimates of persons with addressable disabilities do not include some other individuals who might benefit from improved ICT accessibility standards. Some of the types of individuals with disabilities or population groups who might also benefit from improved ICT accessibility but are not included as persons with addressable disabilities include the following:

- Persons with disabilities living in institutional group settings: The population living in institutional group quarters—including nursing homes, mental (psychiatric) hospitals, correctional facilities, and residential treatment centers—is not captured in SIPP data.[162]
- Persons with photosensitivity-based seizure disorders: SIPP data does not separately categorize persons with seizure disorders. There are two requirements in the proposed rule (i.e., section 405 Flashing and WCAG Success Criteria 2.3.1 Three Flashes or Below Threshold) that are expressly aimed at curbing photosensitive seizures.[163] While the total population of persons with photosensitivity-based seizure disorders is unknown, it is estimated, for example, that there are about 2.3 million adults in the United States with epilepsy.[164]
- Persons with cognitive disabilities: As noted in Table A-5 (Appendix A), several requirements in the proposed rule are likely to benefit persons with cognitive disabilities to a greater or lesser extent depending on the nature and severity of any individual's particular impairment. The requirements include 402.2 Speech-Output Enabled, 402.2.1 User Control, 407 Operable Parts, 407.5 Timed Response, 407.7 Color, and 502 Interoperability With Assistive Technology. The SIPP data is not sufficiently refined to permit "mapping" of these proposed requirements to the likely beneficiary population and, for this reason, persons with cognitive disabilities are not included in the population of persons with addressable disabilities for purposes of this assessment. SIPP data does estimate that about 15.2 million persons have one or more "mental" disabilities, with statistics provided for a few disability sub-types.[165] This figure is undoubtedly larger than likely beneficiaries of the proposed rule with cognitive disabilities, but it nonetheless provides an upper-bound estimate. Moreover, as the TEITAC noted, cognitive disabilities cover a wide spectrum of impairments and capabilities, which makes it challenging to assess the benefits from particular requirements. Accordingly, benefits for persons with cognitive disabilities were not formally calculated in this assessment. Nevertheless, it is clear that many people with cognitive disabilities would benefit to an indeterminate extent from the proposed rule.

[162] See Census Bureau, Americans With Disabilities: 2010 at 2, 4; Peiyun She & David C. Stapleton, Cornell Univ. Inst. for Policy Research, Research Brief: A Review of Disability Data for the Institutional Population (May 2006). According to the Census data, as of 2009, there were about 8.2 million people living in group quarters, with the vast majority of such persons living in adult correctional facilities (2.2 million) and nursing facilities (1.8 million). U.S. Census Bureau, Statistical Abstract of the United States: 2012, Table 73.

[163] See Appendix A, Table A-5 (section 405); World Wide Web Consortium, Understanding WCAG 2.0, Three Flashes or Below Threshold: Understanding SC 2.3.1 (September 2014).

[164] Centers for Disease Control and Prevention, "Epilepsy Fast Facts" (2012).

[165] See Census Bureau, Americans With Disabilities: 2010, Table A-1.

B.2. Use of Electronic Technologies by People With Disabilities

Federal Government agencies increasingly rely on Web sites, applications, and forms to provide information and facilitate transactions with individuals, businesses, and organizations. The 2010 SIPP data provide estimates of the number of people with severe and non-severe disabilities who use the Internet. These estimates were used to estimate the U.S. online population with ICT-addressable disabilities as follows:

- The estimated numbers of people with and without disabilities using the Internet in 2010 were added to estimate the U.S. online population. According to the SIPP estimates, about 60 percent of the U.S. population, but only 38 percent of adults with disabilities, used the Internet in 2010.[166]
- Data from Table D-12 on the SIPP Web site were used to calculate the ratio of Internet access rates for people with and without disabilities in the age 15 to 64 and age 65 and over groups.[167]
- People with vision disabilities and other addressable disabilities were assumed to have the same Internet access rates as people with disabilities that are not addressable by ICT accessibility standards.[168]

Calculations of the numbers of people with vision and other addressable disabilities who were online in 2010 are presented in Table B-2.

[166] Census Bureau, "Computer and Internet Use in the United States: 2010," Table 5, Internet release of June 2012. The Internet access rate estimated from the SIPP data is lower than that reported in other studies of the U.S. adult online population. For example, a Pew Internet and American Life Project survey found that 54 percent of adults living with a disability use the Internet, compared with the 38-percent rate estimated from the SIPP data. See Susanna Fox, "Americans Living With Disability and Their Technology Profile," Pew Internet and American Life Project, January 21, 2011.

[167] Consistent with other studies, the SIPP estimates indicate that people with disabilities had somewhat lower 2010 Internet access rates in both age groups: people with disabilities age 15 to 64 had an online rate of 52 percent, compared with 65 percent for the overall population in this age group. Similarly, 22 percent of people with disabilities age 65 and over were online in 2010, compared with 31 percent of all people 65 and over.

[168] People with vision disabilities have lower Internet access rates than people with other types of disabilities, but most of this difference is attributable to age, rather than the type of disability.

Table B-2: U.S. Online Population With Addressable Disabilities, 2010

Estimate Component	Age 15 to 64	Age 65 and over	Age 15 and over
U.S. population	203,083,000	38,599,000	241,682,000
U.S. population online	133,037,850	12,248,050	145,285,900
Percent of U.S. population online	65.5%	31.7%	60.1%
People with addressable disabilities	14,363,000	14,289,000	28,652,000
Estimated percentage of people with addressable disabilities online	52.4%	22.2%	37.3%
People with addressable disabilities online	**7,527,258**	**3,173,882**	**10,701,140**
People with vision disabilities online	2,250,893	840,060	3,090,953
People with other addressable disabilities online	5,276,365	2,333,822	7,610,187

Source: Census Bureau, Americans With Disabilities: 2010, P70-131, Tables A-1 and D-12; and Computer and Internet Use in the United States: 2010, Table 5.

The percentage of U.S. adults who are online has been increasing steadily, with the largest growth in recent years occurring among those who are age 65 and over. For this analysis, the online percentage of people with addressable disabilities age 15 to 64 is assumed to grow by 1 percentage point annually; the online rate for people with addressable disabilities age 65 and over is assumed to grow by 2 percentage points annually.

B.3. Federal Employment of People With Disabilities

OPM has defined several categories of "reportable disabilities," including hearing impairments, vision impairments, missing extremities, and other disabilities that may be potentially addressable by ICT accessibility standards. Table B-3 presents Fiscal Year 2010 OPM Federal workforce statistics on the numbers of employees who have various types of reportable disabilities, along with Econometrica estimates of the number of employees with disabilities that are most likely to be addressed by ICT accessibility standards ("addressable disabilities").[169]

[169] OPM, Federal Civilian Workforce Statistics: Demographic Profile of the Federal Workforce as of September 2010, "Table 5: Federal Civilian Employment Distribution by Type of Disability," April 2011. Employees who reported being hard of hearing, having no side vision, being blind in one eye, or having one missing, paralyzed, or orthopedically impaired hand were included in the category of people with other addressable disabilities. The statistics in the OPM profile do not include military personnel.

Table B-3: Federal Employees Reporting Various Types of Disabilities, FY 2010

Type of Disability	Reportable	Addressable*
Speech impediments*	1,097	1,097
Hearing*	15,686	15,686
Vision*	9,486	9,486
Missing extremities**	1,445	1,267
Non-paralytic orthopedic impairments**	34,627	3,683
Partial paralysis**	4,871	3,919
Complete paralysis*	1,143	1,143
Convulsive disorders	2,541	0
Mental retardation	1,019	0
Mental illness	5,399	0
Other disabilities***	50,048	0
Disability not listed	17,673	0
Federal employees with disabilities	**145,035**	**36,281**
Total Federal civilian workforce****	2,108,639	2,108,639

Source: OPM, Federal Civilian Workforce Statistics for September 2010.
*Potentially addressed by ICT accessibility requirements.
**Includes disabilities involving hands or arms that are potentially addressed by ICT accessibility requirements.
***Includes heart disease, diabetes, cancer, mental illness, and other conditions.
****Does not include USPS employees or those from some other Federal entities.

About 36,000 Federal civilian employees in 2010 reported having speech, hearing, vision, paralysis, or fine motor skill limitations that are potentially addressed by the current and proposed ICT accessibility requirements. In addition, some Federal employees who did not report having a disability may have single or multiple disabilities that make it difficult to use inaccessible ICT.

Employees of Federal Government contractors perform a substantial and increasing share of Federal agency work. However, data are not available on the number of these employees or the prevalence of various types of disabilities in the Federal contractor workforce.[170]

[170] As noted in the text, some Federal contractors and vendors will be required to begin collecting these data under new Section 503 regulations published by the Department of Labor on September 24, 2013.

Appendix C: 2012 DOJ Report on Section 508 Compliance Rates and Expenditures

DOJ published a comprehensive report on Federal Government Section 508 compliance activities and achievements in 2012.[171] The report provides data that can be used to develop overall estimates of current compliance rates and costs based on survey data collected from Federal agencies. Important results from the survey are presented and discussed in this appendix.

The DOJ survey requested data in four areas:

- General processes for implementing Section 508.
- Procurement.
- Administrative complaints and civil actions.
- Web site, forms, and applications.

The DOJ report indicated that the extent of compliance varies among agencies (and their component branches, divisions, and offices) and activities. Selected results from this survey are presented and discussed in this section.

C.1. Section 508 Policy Development and Training

The DOJ report found that slightly more than 50 percent of agency components had established a general policy to implement and comply with Section 508.[172] Nearly 70 percent of agency components appointed a Section 508 coordinator, and 35 percent of agency components established a Section 508 office or program. However:

- About 40 percent of agency components that developed software had included a process to ensure the accessibility of software.
- About 30 percent of agency components that developed videos or multimedia productions had included a process to ensure the accessibility of training or informational videos or multimedia productions.
- About 40 percent of agency components provided Section 508 training.
- Components provided only a small number of hours of training to their ICT developers (just over 1 hour annually on average) and the acquisition workforce (less than 1 hour).

[171] DOJ, "Section 508 Report to the President and Congress: Accessibility of Federal Electronic and Information Technology," September 2012, available at http://www.ada.gov/508/508_Report.htm.

[172] The survey requested data from individual agency "components"—branches, divisions, and offices. To obtain the most comprehensive and reliable data possible, the survey asked the Federal agencies to identify components within each agency that were responsible for each category of duties referenced in each section of the survey. These agency components completed the survey and submitted the survey responses to their parent agency. The parent agency collected and provided the combined survey responses from all of their components to DOJ. The 89 Federal agencies, including cabinet-level agencies, independent agencies, and boards, commissions, and committees that participated in the survey identified 318 components that provided the responses to the survey.

These results suggest that substantial portions of compliance support activities, particularly training, are provided through channels other than the Section 508 coordinator or program office.

C.2. Section 508 Support Services Provided

The DOJ report indicates that Section 508 offices and programs provide a wide range of compliance support services, notwithstanding generally small budgets (an average of about $400,000 annually) and limited staffing (an average of 2.5 FTE employees). The most common service provided by agency components, regardless of whether they had established a Section 508 office or program, was to evaluate the accessibility of Web sites, and the least common service provided was to evaluate the accessibility of hardware (Table C-1).

Table C-1: Section 508 Services Provided by Agency Components

Q. II.C.6. Section 508 Services Provided	Percentage of Respondents
(a) Assist acquisition officials to prepare Section 508 language in IT contracts	65%
(b) Assist developers to design software that complies with Section 508	66%
(c) Create or repair electronic documents to comply with Section 508	70%
(d) Evaluate Web sites	81%
(e) Evaluate software	65%
(f) Evaluate hardware	41%
(g) Provide training	52%
(h) Provide alternate formats	50%

C.3. Software and Web Application Development

The DOJ report indicated that 75 percent of agency components reported developing software or Web applications. About 40 percent of these agency components reported establishing a policy to ensure the accessibility of software, including testing developed software for compliance (Table C-2).

Table C-2: Software/Web Application Development by Agency Components

Q. II.D.1. Software/Application Development	Percentage of Respondents
(a) Yes, software was developed in house	52%
(b) Yes, but development was limited to contractors	23%
(c) No	25%

C.4. Video/Multimedia Production

The DOJ report indicated that 71 percent of agency components reported developing training or informational videos or multimedia productions. About 30 percent of these agency components reported establishing a policy to ensure the accessibility of videos or multimedia productions, including testing developed videos or multimedia production for compliance (Table C-3).

Table C-3: Video/Multimedia Development by Agency Components

Q. II.D.1. Section 508 Services Provided	Percentage of Respondents
(a) Yes, video or multimedia production was developed in house	52%
(b) Yes, but the production was limited to contractors	18%
(c) No, all productions were procured, or we do not create any video or multimedia productions	29%

C.5. Training Provided

The DOJ report indicated that 41 percent of agency components reported providing Section 508 training. Agency components reported providing the most average hours of training to Section 508 coordinators and the fewest average hours of training to IT help desk staff (Table C-4).

Table C-4: Section 508 Training Provided by Agency Components

Q. II.H.3–10. Section 508 Training Provided	Average Hours Per Employee
(3) Section 508 coordinators	4.2
(4) "Requiring officials" (program managers, contracting officer's representatives, etc.)	0.8
(5) Acquisition workforce (contracting officers, contract specialists, etc.)	0.9
(6) Purchase cardholders	0.8
(7) Web site developers	1.6
(8) Video and multimedia developers	1.0
(9) IT help desk staff	0.6
(10) Other employees	0.7

A majority of agency components that offered training reported online training as the most common method for providing Section 508 training (Table C-5).

Table C-5: Types of Training Provided by Agency Components

Q. II.H.11. Section 508 Training Methods	Percentage
(a) Section 508 universe (www.section508.gov)	52%
(b) Other online training	67%
(c) Classroom instruction	54%
(d) Conferences and seminars	55%
(e) Other	41%

C.6. Procurement

The DOJ report indicated that Federal agencies use multiple ways to specify Section 508 requirements in procurement solicitations. Most agency components incorporated general language about compliance requirements, and about half (48 percent) added language identifying specific requirements applicable to the solicitation.

About half (46 percent) of Federal agency components reported conducting in-house testing of procured ICT to assess compliance with the applicable Section 508 requirements. One-quarter of agency components used third-party testing for at least some procurement (Table C-6).

Table C-6: Types of Testing Used to Assess Procurement Compliance

Q. III.A.3. Acceptance Compliance Testing	Percentage
(a) Testing done in house	46%
(b) Testing done by a third party	25%
(c) Review of material submitted	60%
(d) Special acceptance provisions	12%
(e) No evaluation	18%
(f) Other	13%

C.7. Web Site Compliance

The DOJ report indicated that Federal agency Web sites typically contain multiple elements and types of electronic content. Nearly all (96 percent) of the Web sites included in agency survey responses have PDFs, and three quarters (77 percent) have embedded multimedia content. The majority also contain JavaScript menus, data tables, Flash content, or other elements that require specific attention to make them accessible (Table C-7).

Table C-7: Elements on Agency Web Sites

Q. V.A.3. Web Site Elements	Percentage
Portable document files	96%
Multimedia content	77%
JavaScript or other scripts	75%
Word processing files	74%
Microsoft PowerPoint	67%
Data tables	67%
Spreadsheet files	65%
Flash content	58%

A majority of agencies that have Web sites evaluate them for Section 508 compliance. However, 22 percent reported doing so only when notified about an accessibility issue; 21 percent reported not having conducted an evaluation at all (Table C-8).

Table C-8: Agency Web Site Compliance Testing

Q. V.A.7. Web Policy on Testing	Percentage
Routine automated and manual evaluations	28%
Routine automated evaluations	6%
Routine manual evaluations	24%
Evaluate only when notified	22%
No, but a timetable has been established to do so	9%
No, and there were no plans to do so	12%

Agency Web Site Accessibility

Finally, a majority of agencies indicated that their external Web home pages, forms, and applications complied with each specific Section 508 requirement included in the survey. Reported compliance rates for most specific requirements were in the range between 95 and 76 percent, but lower percentages of agency Web sites reportedly meet the standards for captioning and audio description (Table C-9).

Table C-9: Agency Web Site Compliance With Current Section 508 Requirements

Q.V.B Number	Requirement	Web Site Home Page	Web Forms	Web Applications
3	Text Equivalents	87%	83%	80%
4	Multimedia Content Accessibility Synchronization	76%	65%	65%
5	Appropriate Use of Color	82%	88%	88%
6	Style Sheet Accessibility	92%	92%	87%
7	Server-Side Image Map Accessibility	80%	82%	82%
8	Use of Client-Side Image Map	86%	83%	86%
9	Row and Column Header Identification	88%	83%	82%
10	Data and Header Cell Association	83%	86%	76%
11	Frame Accessibility	86%	90%	82%
12	Designed to Avoid Screen Flicker	95%	96%	94%
14	Java/Flash Accessibility	83%	83%	77%
15	Plug-In or Other Programmatic Object Accessibility	85%	80%	73%
16	Electronic Form Accessibility	87%	86%	80%
17	Navigational Link Skipping	80%	81%	76%
18	Time Limits	76%	77%	75%
19	Keyboard Accessibility	87%	89%	87%
20	Screen Focus	77%	87%	81%
21	Availability of User Interface Information	84%	83%	82%
22	Captioning	69%	69%	64%

Note: Compliance rates exclude agency components that indicated that a particular requirement was not applicable to the contents of their Web site home pages, forms, or applications.

Appendix D: Data on Affected Entities, Products, Services, and Employees

This section provides a description and statistical profile of Federal Government ICT expenditures, purchases, and employment, as well as data on the overall sales of private firms in ICT-related sectors. These statistics provide baseline data for assessing the numbers and types of entities, employees, and expenditures that may be affected by adoption of the rule standards and guidelines.

D.1. Federal Agency ICT Budgets

Federal purchases of hardware, software, services, and content must be made in conformance with the current Section 508 standards. These purchases account for a substantial share of overall agency IT budgets, which must be compiled and reported annually to OMB. Table D-1 shows that the overall Federal Government IT budget has remained essentially flat since 2011. Little, if any, spending growth is anticipated during the next few years.[173]

Table D-1: Federal IT Spending by Federal Agency (Millions)

Federal Agency	FY 2011 Actual	FY 2012 Actual	FY 2013 Budget
Major Civilian Agencies	$41,094	**$40,690**	**$41,766**
DOD	$39,090	$39,588	$38,810
Total for Federal Government	**$80,184**	**$80,278**	**$80,576**

Source: U.S. CIO, "Federal Information Technology, FY 2014 Budget Priorities."

DOD and its constituent service branches accounted for nearly half of the total Federal IT budget in FY 2012. DHS and the Department of Health and Human Services were the only agencies that accounted for more than 10 percent of civilian agency IT spending.[174]

It should be noted that the IT budget numbers reported to OMB include spending by most, but not all, Federal agencies. In addition, these estimates may not include expenditures on certain types of ICT products and services (including multimedia production and telecommunications services) that may be covered under certain provisions in the current Section 508 standards. The

[173] Steven VanRoekel, U.S. Chief Information Officer, "Federal Information Technology, FY 2014 Budget Priorities," and "Federal Information Technology, FY 2013 Budget Priorities: Doing More With Less," undated presentations. IT is defined as "any equipment or interconnected system or subsystem of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by an executive agency." Budget data are compiled and reported according to OMB guidance for Form 53.

[174] Federal IT spending for major civilian agencies includes cabinet-level departments (Agriculture, Commerce, Education, Energy, Health and Human Services, DHS, Housing and Urban Development, Interior, Justice, Labor, State, Transportation, and the Treasury), the Agency for International Development, the Army Corps of Engineers, the Environmental Protection Agency, the General Services Administration, the National Aeronautics and Space Administration, the National Archives and Records Administration, the National Science Foundation, the Nuclear Regulatory Commission, the Office of Personnel Administration, the Small Business Administration, the Smithsonian Institution, and the Social Security Administration.

Federal budget estimate of IT spending can therefore be regarded as a lower-bound estimate of all spending covered by ICT accessibility requirements.

A more inclusive estimate of total Federal ICT spending is available from Deltek, a Government accounting and business intelligence firm that provides projections of future contracting opportunities. Deltek estimates that Federal ICT spending totaled approximately $120 billion in 2012.[175] However, the Deltek budget figure includes spending on weapons systems and other forms of IT that may not be materially affected by the Section 508 requirements.

D.2. Federal Agency ICT Budgets and Purchases

The Federal Procurement Data System (FPDS Next Generation, or FPDS-NG, in its most recent form) provides data on Federal ICT hardware, software, content, and service purchases. Econometrica tabulations of the FPDS-NG data for 2011 are presented in Table D-2.

[175] Deltek's Bjorklund said that "the difference is because the Deltek forecast tries to capture the whole federal 'addressable' market, including the legislative and judicial branches and a host of independent and quasi-governmental agencies, such as the U.S. Postal Service, Fannie Mae, Freddie Mac, and the Tennessee Valley Authority. The company also includes spending on IT systems contained within other programs, such as aircraft and weapons systems, and estimates on IT spending within the U.S. intelligence community." Quoted in Information Week, "Federal IT Spending Likely to Decline," June 20, 2012.

Table D-2: Federal Purchases From Selected ICT Sectors, Calendar Year (CY) 2011

NAICS Code and Description	Number of Purchases	Millions of Dollars
Computer and electronic product manufacturing		
334111 Electronic computers	37,078	$3,581.5
334112 Computer storage devices	3,994	$321.2
334113 Computer terminals	421	$42.0
334119 Other computer peripheral equipment	7,631	$794.3
334210 Telephone apparatus	4,240	$742.8
334220 Radio and television broadcasting and wireless communications equipment	14,979	$5,470.8
334290 Other communications equipment manufacturing	12,580	$2,103.3
334310 Audio and video equipment	3,729	$135.7
Manufacturing subtotal	**84,652**	**$13,191.6**
Information services		
511210 Software publishers	15,950	$1,377.5
514210 Data processing services	279	$201.7
516110 Internet publishing and broadcasting	50	$15.0
518111 Internet service providers	692	$89.0
518112 Web search portals	17	$0.7
518210 Data processing, hosting, and related services	7,479	$1,229.9
519130 Internet publishing, broadcasting, and Web search portals	1,989	$82.6
5121 Motion picture and video industries	1,955	$70.8
5122 Sound recording industries	268	$5.8
5141 Information services	4,035	$474.4
513/517 Telecommunications services	87,623	$8,283.7
515 Broadcasting/cable services	4,332	$71.6
Information services subtotal	**124,669**	**$11,902.7**
Office equipment rental and leasing		
532420 Office equipment rental and leasing	5,459	$307.6
Rental and leasing subtotal	**5,459**	**$307.6**
Computer systems design and related services		
541511 Custom computer programming services	21,380	$5,887.4
541512 Computer systems design services	21,268	$9,885.1
541519 Other computer-related services	75,659	$11,918.2
Computer services subtotal	**118,307**	**$27,690.7**
Total IT purchases	**333,807**	**$53,092.7**

Source: Econometrica tabulations of downloaded CY 2011 Federal Procurement Data System data.

Table D-2 shows that computer systems design and related services accounted for $27.7 billion of the $53.0 billion of total Federal IT purchases in 2011. Hardware purchases totaled $13.2 billion in 2011, and information services accounted for $11.9 billion in Federal ICT purchases. Telecommunications services accounted for the majority of Federal information services purchases ($8.3 billion of the $11.9 billion total).

D.3. Federal Employment in IT, Contracting, and Other Selected Occupations

Significant numbers of Federal employees work in IT, contracting, and other occupations that can be expected to have specific responsibilities for ensuring that agencies comply with their current and future Section 508 obligations. FY 2011 OPM employment and salary data for selected occupations are presented in Table D-3.

Table D-3: Federal Employment in Selected Occupations, 2011

Occupation (Code)	Number of Employees	Average Salary
IT-related occupations		
Information technology (2200)	81,639	$93,100
IT subtotal	**81,639**	**$93,100**
Contracting-related occupations		
Contracting (1102)	36,890	$85,541
Purchasing (1105)	3,329	$48,663
Procurement technician (1106)	1,655	$45,448
Contracting subtotal	**41,874**	**$81,025**
Other occupations likely to have Section 508 compliance obligations		
Audiovisual production (1071)	1,184	$82,890
Writing and editing (1082)	1,397	$86,349
Technical writing and editing (1083)	1,206	$77,306
Visual information (1084)	1,820	$77,914
Editorial assistance (1085)	204	$45,972
Program management (0340)	14,571	$130,872
Administrative officer (0341)	9,336	$80,180
EEO compliance (0360)	1,633	$89,959
EEO assistance (0361)	347	$47,730
Human resource management (0201)	28,034	$83,356
Human resource assistance (0203)	12,883	$42,174
Mediation (0241)	188	$120,213
Training (0243)	89	$91,551
Labor management relations (0244)	315	$106,882
EEO (0260)	2,673	$93,206
Employee benefits lawyer (0958)	133	$110,117
Other selected occupation subtotal	**76,013**	**$85,386**
Total employees in selected occupations	**199,526**	
IT percentage of total	41%	
Contracting percentage of total	21%	

Source: Tabulations of December 2011 OPM FedScope Employment Data “cube.”

Of the approximately 200,000 Federal employees in these selected occupations, 41 percent (81,639) work in IT and another 21 percent (41,874) work in contracting-related jobs. It should be noted that in addition to the remaining categories of Federal employees shown in Table D-3, other Federal employees may be required to prepare or participate in the creation of Section 508-compliant materials in the course of the regular performance of their duties. Federal agencies may increase, decrease, or change the categories and numbers of Federal employees who would be required to create or repair electronic documents if the proposed standards are adopted.

Some Federal contractor and vendor employees are also required to design, create, maintain, or repair accessible ICT. There are no data available on the number of such employees or the average level of compensation for various occupations.

D.4. ICT Manufacturing

The Census Bureau recently released 2012 Economic Census data for the computer, telecommunications, and audio/video equipment manufacturing sectors. Selected data are presented Table D-4.[176]

Table D-4: Number of Companies and Primary Product Shipments for Selected ICT Sectors, 2012

6-Digit NAICS Code and Description	Number of Companies	Number of Employees	Primary Product Shipments (Millions)
334111 Electronic computer manufacturing	360	18,785	$9,665
334112 Computer storage device manufacturing	105	15,641	$11,069
334118 Computer terminal and other computer peripheral equipment manufacturing	611	24,238	$11,412
334210 Telephone apparatus manufacturing	251	17,989	$8,142
334220 Radio and television broadcasting and wireless communications equipment manufacturing	753	67,868	$27,412
334290 Other communications equipment manufacturing	363	14,910	$5,020
334310 Audio and video equipment manufacturing	457	9,559	$2,925
Total ICT	**2,900**	**168,990**	**$75,646**

Source: Economic Census, Detailed Statistics by Industry for the United States: 2012

U.S. electronic computer (334111), computer terminal/peripheral (334118), telephone apparatus (334210), wireless communications equipment (included in 334220), and audio/video equipment (334310) manufacturers produce types of equipment that are most likely to be covered under the current Section 508 standards or Section 255 guidelines. However, some types of equipment produced by manufacturers in these sectors would not be required to be accessible.

A substantial amount of computer and telecommunications equipment is imported. Data are not available on the numbers of foreign manufacturers and the level of employment. Moreover,

[176] Estimates of the numbers of ICT firms from the 2011 Census Statistics of U.S. Business are used in the estimates of telecommunication manufacturer product support costs presented in Sections 6.3 and 9.3 to be consistent with the estimates presented in the NPRM Paperwork Reduction Analysis. The numbers of firms and employees are very similar in the two Census data sources.

sector-specific estimates of the value of imports are only available through the second quarter of 2011, when the Census Bureau suspended issuing detailed Current Industrial Reports data. The value of imports shipments was estimated at $79.4 billion and $68.5 billion, respectively, for computer and telecommunications equipment manufacturing.[177]

Based on a review of more detailed shipments data, about two-thirds of the aggregate value of ICT products in these sectors (i.e., about $50 billion annually each for U.S. manufacturers and imports from foreign manufacturers) would potentially be covered by the proposed Section 508 standards or Section 255 guidelines.

D.5. Private-Sector IT Employment

BLS estimates provide a more detailed breakout of IT employment and salaries for the specific occupational classifications in the private sector than is available for Federal employees.[178] Private-sector IT employment and salary data for 2011 are summarized in Table D-5.

Table D-5: Private-Sector Employment in IT-Related Occupations, 2011

SOC Code*	Occupation	Number of Employees	Average Salary
151111	Computer and information research scientists	25,160	$103,160
151121	Computer systems analysts	487,740	$82,320
151131	Computer programmers	320,100	$76,010
151132	Software developers applications	539,880	$92,080
151133	Software developers systems software	387,050	$100,420
151141	Database administrators	108,500	$77,350
151142	Network and computer systems administrators	341,800	$74,270
151150	Computer support specialists	632,490	$51,820
151179	Information security analysts, Web developers, and computer network architects	272,670	$81,670
151199	Computer occupations (all other)	177,630	$80,500
	Total	**3,293,020**	**$78,584**
	Software developers (151132/151133)	926,930	$95,562
	Web developers (151179)**	136,335	$81,670

*BLS Standard Occupational Classification code.
**Assumed to be 50 percent of SOC 151179 employees.
Source: BLS Occupational Employment Statistics for May 2012.

The OPM Federal employee data do not provide average salaries for specific IT occupations. The BLS data for private-sector employment indicate that annual salaries for software developers and Web developers averaged $95,600 and $81,700, respectively, in 2011.

[177] Census Bureau, Current Industrial Reports, MQ334R - Computers and Peripheral Equipment, June 2011, and MQ334P - Telecommunications, July 2011.
[178] BLS, "May 2012 National Occupational Employment and Wage Estimates." The Occupational Employment Statistics (OES) survey covers all full-time and part-time wage and salary workers in nonfarm industries. Surveys collect data for the payroll period, including the 12th day of May. The survey does not cover the self-employed, owners and partners in unincorporated firms, household workers, or unpaid family workers.

Appendix E: Annual Estimates of Monetized Benefits and Costs

The annual values of the benefits estimated in Sections 5.1 through 5.3 are shown in Table E-1.

Table E-1: Annual Value of Monetized Benefits, 2015–2024 (Millions)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2015–2024
Benefits from increased Federal employee productivity	$23.3	$46.7	$46.7	$46.7	$46.7	$46.7	$46.7	$46.7	$46.7	$46.7	$443.5
Benefits from improved Federal Government Web site accessibility to people with vision disabilities	$1.0	$2.0	$2.1	$2.2	$2.3	$2.4	$2.6	$2.7	$2.8	$2.9	$23.0
Benefits to Federal Agencies from reduced call volumes	$8.1	$17.1	$17.9	$18.8	$19.7	$20.7	$21.7	$22.7	$23.8	$25.0	$195.5
Total monetized benefits	**$32.4**	**$65.8**	**$66.7**	**$67.7**	**$68.7**	**$69.8**	**$70.9***	**$72.1**	**$73.3**	**$74.6**	**$662.0**
Present value in 2015 (7% discount rate)	$32.4	$61.5	$58.3	$55.3	$52.4	$49.8	$47.3	$44.9	$42.7	$40.6	$485.0
Present value in 2015 (3% discount rate)	$32.4	$63.9	$62.9	$62.0	$61.1	$60.2	$59.4	$58.6	$57.9	$57.2	$575.4
Annualized value (7% discount rate)	$69.1	$69.1	$69.1	$69.1	$69.1	$69.1	$69.1	$69.1	$69.1	$69.1	$69.1
Annualized value (3% discount rate)	$67.5	$67.5	$67.5	$67.5	$67.5	$67.5	$67.5	$67.5	$67.5	$67.5	$67.5

*Benefit numbers do not sum to total because of rounding.

The annual values of the costs estimated in Sections 9.1 through 9.5 are shown in Table E-2.

Table E-2: Annual Value of Monetized Costs, 2015–2024 (Millions)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2015–2024
Total in-house ICT cost	$102.7	$102.7	$65.8	$65.8	$65.8	$65.8	$65.8	$65.8	$65.8	$65.8	$732.2
Procured ICT cost	$94.8	$94.8	$60.8	$60.8	$60.8	$60.8	$60.8	$60.8	$60.8	$60.8	$675.9
Manufacturers Web site and content development	$17.0	$20.4	$6.8	$6.8	$6.8	$6.8	$6.8	$6.8	$6.8	$6.8	$92.0
Total monetized cost	**$214.5**	**$217.9**	**$133.4**	**$133.4**	**$133.4**	**$133.4**	**$133.4**	**$133.4**	**$133.4**	**$133.4**	**$1,500.0***
Present value in 2015 (7% discount rate)	$214.5	$203.7	$116.6	$108.9	$101.8	$95.1	$88.9	$83.1	$77.7	$72.6	$1,162.9
Present value in 2015 (3% discount rate)	$214.5	$211.6	$125.8	$122.1	$118.6	$115.1	$111.8	$108.5	$105.3	$102.3	$1,335.6
Annualized cost (7% discount rate)	$165.6	$165.6	$165.6	$165.6	$165.6	$165.6	$165.6	$165.6	$165.6	$165.6	$165.6
Annualized cost (3% discount rate)	$156.6	$156.6	$156.6	$156.6	$156.6	$156.6	$156.6	$156.6	$156.6	$156.6	$156.6

*Cost numbers do not sum to total because of rounding.