

REPORT

Final Regulatory Impact Analysis

**Final Rule to Update the Section 508 Standards and
Section 255 Guidelines**

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1331 F Street, NW
Suite 1000
Washington, DC 20004-1111

Submitted By:

Econometrica, Inc.
7475 Wisconsin Avenue
Suite 1000
Bethesda, MD 20814
www.EconometricaInc.com

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Table of Contents

LIST OF TABLES.....	V
EXECUTIVE SUMMARY	1
1. INTRODUCTION: UPDATE OF THE SECTION 508 STANDARDS AND THE SECTION 255 GUIDELINES	1
2. FRAMEWORK TO EVALUATE THE REVISED ICT STANDARDS AND GUIDELINES.....	4
3. CURRENT STANDARDS AND GUIDELINES TO ENSURE EQUAL ACCESS TO ICT FOR PEOPLE WITH DISABILITIES	6
3.1. SECTION 508 STANDARDS	6
3.2. SECTION 255 GUIDELINES	7
3.3. W3C CONSENSUS STANDARDS.....	8
3.4. SECTIONS 501 AND 504 OF THE REHABILITATION ACT OF 1973	9
4. AN OVERVIEW OF THE REVISED 508 STANDARDS AND 255 GUIDELINES.....	11
4.1. NEED FOR REVISION OF CURRENT STANDARDS AND GUIDELINES	11
4.2. WCAG 2.0 AND OTHER REVISED ACCESSIBILITY STANDARDS: WHAT WILL BE REQUIRED?	14
4.3. ICT CONTENT, APPLICATIONS, AND EQUIPMENT: WHAT WILL BE COVERED?	15
4.4. MAJOR NEW REQUIREMENT AREAS IN THE REVISED STANDARDS AND GUIDELINES	17
4.5. SCOPE OF REVISED ICT STANDARDS AND GUIDELINES: WHAT ENTITIES WILL HAVE TO COMPLY?	21
5. SIGNIFICANT CHANGES FROM THE PRELIMINARY REGULATORY IMPACT ANALYSIS TO THE FINAL REGULATORY IMPACT ANALYSIS	23
6. INCREMENTAL BENEFITS OF THE FINAL RULE	25
6.1. TYPES OF ADDRESSABLE DISABILITIES AND NUMBER OF POTENTIAL BENEFICIARIES.....	25
6.2. BENEFITS FOR FEDERAL EMPLOYEES WITH DISABILITIES	27
6.3. BENEFITS FOR CITIZENS AND OTHER RESIDENTS WITH DISABILITIES	33
6.4. BENEFITS FOR FEDERAL AGENCIES	41
6.5. BENEFITS FROM INCREASED AVAILABILITY OF ACCESSIBLE TELECOMMUNICATIONS PRODUCTS, DOCUMENTATION, AND SUPPORT SERVICES.....	44
6.6. BENEFITS ACCRUING TO OTHER ENTITIES.....	45
6.7. SUMMARY OF BENEFITS	45



7. BASELINE COMPLIANCE COSTS48

7.1. FEDERAL AGENCY IN-HOUSE BASELINE COSTS49

7.2. BASELINE COST ESTIMATES FOR PROCURED ICT57

7.3. BASELINE COST ESTIMATES FOR COMPLYING WITH CURRENT SECTION 255 GUIDELINES.....60

7.4. SUMMARY OF BASELINE SECTION 508 AND SECTION 255 COMPLIANCE COSTS62

8. FACTORS AFFECTING FUTURE COMPLIANCE COSTS UNDER THE CURRENT ICT STANDARDS AND GUIDELINES.....63

8.1. FACTORS AFFECTING FEDERAL AGENCY SECTION 508 COMPLIANCE COSTS63

8.2. FACTORS AFFECTING TELECOMMUNICATIONS MANUFACTURER COSTS TO COMPLY WITH THE SECTION 255 GUIDELINES64

9. MAJOR NEW REQUIREMENTS IN THE FINAL RULE.....65

9.1. AREA 1: APPLYING WCAG 2.0 TO SOFTWARE AND APPLICATIONS66

9.2. AREA 2: ACCESSIBILITY FEATURES WITHIN SOFTWARE APPLICATIONS AND OPERATING SYSTEMS66

9.3. AREA 3: AUTHORING TOOLS66

9.4. AREA 4: ASSISTIVE TECHNOLOGY67

9.5. AREA 5: ELECTRONIC CONTENT AND DATA67

9.6. AREA 6: COLOR AND CONTRAST SETTINGS67

9.7. AREA 7: AUDIO CONTROLS ON WEB PAGES68

9.8. AREA 8: USER CONTROLS FOR CAPTIONS AND VIDEO DESCRIPTION.....68

9.9. SECTION 508 HARDWARE AND EQUIPMENT COSTS68

9.10. SECTION 255 ELECTRONIC DOCUMENTATION AND SUPPORT COSTS69

10. INCREMENTAL COST ESTIMATES OF THE FINAL RULE71

10.1. FEDERAL AGENCY INCREMENTAL COSTS FOR IN-HOUSE ICT.....71

10.2. ESTIMATED COST INCREASES ASSOCIATED WITH PROCURED ICT85

10.3. COMPLIANCE COSTS ASSOCIATED WITH REVISED SECTION 255 GUIDELINES.....89

10.4. SUMMARY OF MONETIZED AND UNQUANTIFIED INCREMENTAL COSTS OF THE FINAL RULE91

11. CONCLUSION.....94

APPENDIX A: ICT ACCESSIBILITY STANDARDS..... A-1

APPENDIX B: DATA ON PEOPLE WITH DISABILITIESB-1



APPENDIX C: 2012 DOJ REPORT ON SECTION 508 COMPLIANCE RATES AND EXPENDITURES C-1

APPENDIX D: DATA ON AFFECTED ENTITIES, PRODUCTS, SERVICES, AND EMPLOYEES D-1

APPENDIX E: ANNUAL ESTIMATES OF MONETIZED INCREMENTAL BENEFITS AND COSTSE-1



List of Tables

TABLE ES-1. ANNUALIZED VALUE OF MONETIZED INCREMENTAL BENEFITS AND COSTS, 2018–2027 (MILLIONS OF 2017 DOLLARS)	4
TABLE ES-2. UNQUANTIFIED BENEFITS OF THE FINAL RULE	5
TABLE ES-3. UNQUANTIFIED COSTS OF THE FINAL RULE	7
TABLE 1. VALUE OF INCREASED FEDERAL EMPLOYEE PRODUCTIVITY, 2015	31
TABLE 2. NUMBER OF FEDERAL EMPLOYEES WITH ADDRESSABLE DISABILITIES	31
TABLE 3. ESTIMATED BENEFITS FROM INCREASED PRODUCTIVITY OF FEDERAL EMPLOYEES WITH ADDRESSABLE DISABILITIES	32
TABLE 4. PROPORTION OF ADULT INTERNET USERS VISITING GOVERNMENT WEB SITES	34
TABLE 5. AVERAGE AMOUNT OF TIME SAVED PER PERSON WITH VISION DISABILITIES FROM INCREASED WEB ACCESSIBILITY	36
TABLE 6. NUMBER OF PEOPLE WITH VISION DISABILITIES WHO WILL BENEFIT FROM IMPROVED GOVERNMENT WEB SITE ACCESSIBILITY AND AMOUNT OF TIME SAVED	37
TABLE 7. MONETIZED BENEFITS OF IMPROVED GOVERNMENT WEB SITE ACCESSIBILITY TO PERSONS WITH VISION DISABILITIES	39
TABLE 8. NUMBER OF PEOPLE WITH OTHER ADDRESSABLE DISABILITIES WHO WILL BENEFIT FROM IMPROVED GOVERNMENT WEB SITE ACCESSIBILITY AND AMOUNT OF TIME SAVED	41
TABLE 9. MONETIZED BENEFITS OF IMPROVED GOVERNMENT WEB SITE ACCESSIBILITY TO PERSONS WITH OTHER ADDRESSABLE DISABILITIES	41
TABLE 10. ESTIMATED BENEFITS TO FEDERAL AGENCIES FROM REDUCED CALL VOLUMES	43
TABLE 11. ANNUALIZED VALUE OF MONETIZED BENEFITS, 2018–2027 (MILLIONS OF 2017 DOLLARS)	46
TABLE 12. UNQUANTIFIED BENEFITS OF THE FINAL RULE	46
TABLE 13. ANNUAL BASELINE COST OF SECTION 508 POLICY DEVELOPMENT AND IMPLEMENTATION	49
TABLE 14. ANNUAL BASELINE COST OF FEDERAL EMPLOYEE TRAINING	50
TABLE 15. ANNUAL BASELINE COST OF SOFTWARE/WEB/AUDIOVISUAL MEDIA ACCESSIBILITY COMPLIANCE	52



TABLE 16.	ANNUAL BASELINE COST OF SOFTWARE/WEB/AUDIOVISUAL MEDIA EVALUATION	53
TABLE 17.	ANNUAL BASELINE COST OF SECTION 508-COMPLIANT CONTENT CREATION.....	56
TABLE 18.	ANNUAL BASELINE FEDERAL AGENCY COMPLIANCE COSTS FOR IN-HOUSE ICT (MILLIONS)	56
TABLE 19.	ESTIMATES OF FEDERAL ICT PURCHASE SHARE, 2012	58
TABLE 20.	ANNUAL BASELINE COMPLIANCE COST ESTIMATE FOR PROCURED ICT.....	59
TABLE 21.	ANNUAL BASELINE COMPLIANCE COST ESTIMATES (BILLIONS).....	62
TABLE 22.	TELECOMMUNICATIONS EQUIPMENT MANUFACTURER SUPPORT PAGES	69
TABLE 23.	PROJECTED 10-YEAR COST INCREASE FOR POLICY DEVELOPMENT AND IMPLEMENTATION	72
TABLE 24.	PROJECTED 10-YEAR COST INCREASE FOR CURRENT FEDERAL EMPLOYEE TRAINING	73
TABLE 25.	ADDITIONAL FEDERAL WORKERS WITH SECTION 508 COMPLIANCE RESPONSIBILITIES	75
TABLE 26.	10-YEAR COST OF TRAINING ADDITIONAL EMPLOYEES WITH SECTION 508 RESPONSIBILITIES.....	76
TABLE 27.	TOTAL 10-YEAR COST INCREASES FOR FEDERAL EMPLOYEE TRAINING.....	77
TABLE 28.	PROJECTED 10-YEAR COST INCREASE FOR SOFTWARE/WEB/MULTIMEDIA DEVELOPMENT COMPLIANCE.....	78
TABLE 29.	PROJECTED 10-YEAR COST INCREASE FOR SOFTWARE/WEB/AUDIOVISUAL MEDIA EVALUATION.....	80
TABLE 30.	PROJECTED 10-YEAR COST INCREASE FOR SECTION 508-COMPLIANT DOCUMENT CREATION FOR FEDERAL EMPLOYEES WITH CURRENT COMPLIANCE RESPONSIBILITIES.....	81
TABLE 31.	PROJECTED DOCUMENT CREATION COSTS INCREASE FOR ADDITIONAL EMPLOYEES WITH SECTION 508 COMPLIANCE RESPONSIBILITIES	82
TABLE 32.	TOTAL 10-YEAR DOCUMENT CREATION COST INCREASES	82
TABLE 33.	ESTIMATES OF THE PERCENTAGE INCREASES IN AGENCY COMPLIANCE COSTS FOR IN-HOUSE ICT.....	83
TABLE 34.	PROJECTED INCREASE IN ANNUAL AGENCY COMPLIANCE COSTS FOR IN-HOUSE ICT (MILLIONS OF 2017 DOLLARS).....	83



TABLE 35. PRESENT VALUE IN 2017 OF MONETIZED 2018–2027 INCREMENTAL COSTS FOR IN-HOUSE ICT (MILLIONS OF 2017 DOLLARS).....84

TABLE 36. INCREMENTAL COSTS TO PLACE BRAILLE INSTRUCTIONS ON CERTAIN TYPES OF ICT87

TABLE 37. ESTIMATES OF INCREASED COSTS ASSOCIATED WITH PROCURED ICT (MILLIONS OF 2017 DOLLARS).....87

TABLE 38. PRESENT VALUE IN 2017 OF MONETIZED 2018–2027 COSTS FOR PROCURED ICT (MILLIONS OF 2017 DOLLARS).....88

TABLE 39. ESTIMATED 2018–2027 CONFORMANCE COSTS FOR MANUFACTURER WEB SITES AND CONTENT.....90

TABLE 40. ANNUALIZED COMPLIANCE COSTS FOR THE FINAL RULE, 2018–2027 (MILLIONS OF 2017 DOLLARS).....91

TABLE 41. UNQUANTIFIED INCREMENTAL COSTS OF THE FINAL RULE92

TABLE 42. ANNUALIZED VALUE OF MONETIZED BENEFITS AND COSTS, 2018–2027 (MILLIONS OF 2017 DOLLARS).....94

TABLE A-1. WCAG 2.0 LEVEL A AND LEVEL AA SUCCESS CRITERIA A-2

TABLE A-2. FINAL RULE REQUIREMENTS FOR SOFTWARE A-7

TABLE A-3. FINAL RULE REQUIREMENTS FOR HARDWARE AND TELECOMMUNICATIONS EQUIPMENT A-10

TABLE A-4. FINAL RULE ACCESSIBILITY REQUIREMENTS FOR SUPPORT DOCUMENTATION AND SERVICES A-23

TABLE A-5. FINAL RULE PROVISIONS BENEFITTING PEOPLE WITH SPECIFIC TYPES OF DISABILITIES A-25

TABLE B-1. U.S. POPULATION WITH ADDRESSABLE DISABILITIES, 2010B-1

TABLE B-2. U.S. ONLINE POPULATION WITH ADDRESSABLE DISABILITIES, 2010B-4

TABLE B-3. FEDERAL EMPLOYEES REPORTING VARIOUS TYPES OF DISABILITIES, FY 2010.....B-5

TABLE C-1. SECTION 508 SERVICES PROVIDED BY AGENCY COMPONENTSC-2

TABLE C-2. SOFTWARE/WEB APPLICATION DEVELOPMENT BY AGENCY COMPONENTSC-2

TABLE C-3. VIDEO/MULTIMEDIA DEVELOPMENT BY AGENCY COMPONENTSC-3

TABLE C-4. SECTION 508 TRAINING PROVIDED BY AGENCY COMPONENTSC-3



TABLE C-5. TYPES OF TRAINING PROVIDED BY AGENCY COMPONENTSC-3

TABLE C-6. TYPES OF TESTING USED TO ASSESS PROCUREMENT COMPLIANCEC-4

TABLE C-7. ELEMENTS ON AGENCY WEB SITES.....C-4

TABLE C-8. AGENCY WEB SITE COMPLIANCE TESTINGC-4

TABLE C-9. AGENCY WEB SITE COMPLIANCE WITH CURRENT SECTION 508 REQUIREMENTS ..C-5

TABLE D-1. FEDERAL IT SPENDING BY FEDERAL AGENCY (MILLIONS) D-1

TABLE D-2. FEDERAL PURCHASES FROM SELECTED ICT SECTORS, CALENDAR YEAR (CY) 2015..... D-2

TABLE D-3. FEDERAL EMPLOYMENT IN SELECTED OCCUPATIONS, 2015 D-3

TABLE D-4. NUMBER OF COMPANIES AND PRIMARY PRODUCT SHIPMENTS FOR SELECTED ICT SECTORS, 2012..... D-4

TABLE D-5. PRIVATE-SECTOR EMPLOYMENT IN IT-RELATED OCCUPATIONS, 2015 D-6

TABLE E-1. ANNUAL VALUE OF INCREMENTAL MONETIZED BENEFITS, 2018–2027 (MILLIONS) E-1

TABLE E-2. ANNUAL VALUE OF INCREMENTAL MONETIZED COSTS, 2018–2027 (MILLIONS) ...E-2



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 Rehabilitation Act of 1973, as amended in 1998, is intended to ensure that people with various types of disabilities have equal access to information and communication 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 Communications Act of 1934, as amended, requires telecommunication equipment to be accessible to and usable by individuals with disabilities where “readily achievable”. The Access Board is statutorily responsible for developing accessibility guidelines for telecommunication equipment and customer premise equipment (CPE) and for reviewing and updating the guidelines periodically. The Federal Communications Commission (FCC), is, however, solely responsible for issuing implementing regulations and enforcing Section 255. The FCC is not bound to adopt the Access Board’s guidelines as its own or to use them as minimum standards. In 1998, the Access Board published Section 255 guidelines.

ES.1. The Final Rule

The Access Board is revising and updating, in a single rulemaking, both its standards for electronic and information technology developed, procured, maintained, or used by Federal agencies covered by Section 508 of the Rehabilitation Act of 1973, and its guidelines for telecommunications equipment and CPE covered by Section 255 of the Communications Act of 1934. The revisions and updates to the Section 508-based standards and Section 255-based guidelines are intended to ensure that ICT covered by the respective statutes is accessible to and usable by individuals with disabilities. According to the preamble, “one of the primary purposes of the final rule is to replace the current product-based approach with requirements based on functionality, and, thereby, ensure that accessibility for people with disabilities keeps pace with advances in ICT.”²

¹ The term “information and communication technology” is used throughout the preamble and final 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 Architectural and Transportation Barriers Compliance Board, 36 CFR Parts 1193 and 1194, RIN 3014-AA37, *Information and Communication Technology (ICT) Standards and Guidelines, Final Rule*.



The final rule updates the existing Section 508 standards and Section 255 guidelines using the most recent version of the Web Content Accessibility Guidelines (WCAG 2.0)³ 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 final rule specifically requires 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.

Other consensus standards for digital television tuners, software user interfaces, electronic documents in Portable Document Format (PDF), and other aspects of ICT performance are also incorporated by reference. Federally procured IT hardware and telecommunications equipment will 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 final rule provisions with the current Section 508 standards and Section 255 guidelines is provided in Appendix A.

The final rule includes a so-called “safe harbor” provision that exempts existing (i.e., “legacy”) ICT from having to modify or upgrade to conform to the Revised 508 Standards so long as such ICT complies with the existing 508 regulations and is not “altered” after the compliance date (which is one year after publication of the final rule). “Alterations” consist of changes that materially affect the accessibility or usability of the covered hardware, software, or content (i.e., changes that affect interoperability, the user interface, or access to information or data). Importantly, the safe harbor provision in the Revised 508 Standards operates on an element-by-element basis; that is, each portion or component of the existing ICT is examined independently to assess the applicability of the safe harbor exemption.

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

ES.2. Summary of Incremental Benefits and Costs of the Final Rule

The primary focus of this regulatory impact analysis (RIA) was to define and, where possible, quantify and monetize the potential societal benefits and costs of the revised Section 508 standards and Section 255 guidelines (hereinafter referred to as incremental benefits and incremental costs). Incremental benefits were evaluated for Federal employees and other people with various types of vision, hearing, learning, and speech disabilities and those with manipulation, reach, or strength

³ 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).

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



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 revised requirements will 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 revised requirements on people with particular types or combinations of disabilities. For example, quantifying the impact of the revised requirements to improve the accessibility of Web site and software error notification and handling provisions will 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 revised 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 will increase the range of tasks that a Federal employee or person with a disability can complete independently. More generally, enhanced ICT accessibility for persons with disabilities can be expected to improve civic engagement, decrease stigma, 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—will also be likely to assist U.S. ICT companies by helping 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 revised 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 revised 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 incremental 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.

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



The impact on computer and telecommunications equipment manufacturers from the revised rule is particularly difficult to quantify. Information on the impact of the revised accessibility requirements was solicited in both the 2010 and 2011 Advance Notice of Proposed Rulemaking (ANPRM) and again in the Notice of Proposed Rulemaking (NPRM) and the preliminary regulatory impact analysis (PRIA).

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 potential impact on consumer prices can be assessed by assuming that these manufacturers will incur compliance costs equal to the entire amount estimated in this analysis for Federal agencies, contractors, and vendors (about \$182.4 million on an annualized basis) with the aggregate value of annual shipments in these industries (about \$75.6 billion⁶). The RIA concludes that any such cost increase will be negligible—not more than 0.3 percent (= \$182.4 million / \$75.6 billion) under the assumed upper bound of annualized compliance costs for computer and telecommunications equipment manufacturers.

Table ES-1 summarizes the estimates of monetized incremental benefits and costs developed for the revised Section 508 standards and Section 255 guidelines. All benefits and costs were estimated for a 10-year time horizon starting in 2018 since the final rule requires Federal agencies to comply one year after its publication and converted to annualized values using discount rates of 7 and 3 percent. Three scenarios of incremental benefits and costs are presented illustrating incremental benefits and costs of the rule using alternative parameters that are not based on published estimates (i.e., are assumptions made). These three scenarios include: a low net benefit (using parameters which result in lower benefits and higher costs), an expected (consisting of expected values for assumed parameters), and a high net benefit (using parameters which result in higher benefits and lower costs).

Table ES-1. Annualized Value of Monetized Incremental Benefits and Costs, 2018–2027 (Millions of 2017 Dollars)

Monetized Benefits and Costs	Low Net Benefit Scenario		Expected Scenario		High Net Benefit Scenario	
	7-Percent Discount Rate	3-Percent Discount Rate	7-Percent Discount Rate	3-Percent Discount Rate	7-Percent Discount Rate	3-Percent Discount Rate
Benefits from increased Federal employee productivity	\$18.2	\$19.3	\$47.7	\$50.6	\$151.8	\$160.9
Benefits from improved Federal Government Web site accessibility to people with addressable disabilities	\$2.8	\$3.0	\$2.8	\$3.0	\$2.8	\$3.0

⁶ See Table D-4 in Appendix D.



Monetized Benefits and Costs	Low Net Benefit Scenario		Expected Scenario		High Net Benefit Scenario	
	7-Percent Discount Rate	3-Percent Discount Rate	7-Percent Discount Rate	3-Percent Discount Rate	7-Percent Discount Rate	3-Percent Discount Rate
Benefits to Federal agencies from reduced call volumes	\$10.9	\$11.7	\$21.9	\$23.4	\$32.8	\$35.1
Annualized value of monetized benefits	\$32.0	\$34.0	\$72.4	\$77.0	\$187.4	\$199.0
In-house ICT costs	\$150.1	\$156.2	\$93.8	\$98.3	\$60.4	\$63.5
Procured ICT costs	\$126.1	\$131.2	\$79.0	\$82.8	\$51.1	\$53.7
Costs of telecommunication s manufacturer product support Web site and content development	\$9.5	\$9.6	\$9.5	\$9.6	\$9.5	\$9.6
Annualized value of monetized costs	\$285.7	\$296.9	\$182.4	\$190.7	\$121.0	\$126.8

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

ES.3. Incremental Benefits of the Rule

This regulatory evaluation includes monetized estimates for three types of benefits that can be expected from adopting the revised Section 508 requirements. These benefits have an equivalent annualized value of \$72.4 million (sensitivity analysis range: \$32.0 million to \$187.4 million) over the 10-year analysis period using a 7-percent discount rate (see Table ES-1).

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

Table ES-2. Unquantified Benefits of the Final Rule

Benefits
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.



Benefits

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.

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.

Cost savings to Agencies already complying with the equivalent WCAG 2.0 standards because of the availability of WCAG 2.0 support materials.

ES.4. Current (Baseline) Section 508 and Section 255 Costs

There are few data on federal agencies' compliance with the Section 508 standards. In 2012, the U.S. Department of Justice (DOJ) surveyed federal agencies and their components on Section 508 compliance activities and achievements. The survey requested data in four areas: general processes for implementing Section 508, procurement policies, administrative complaints and civil actions, and subjective assessment of Web site compliance. Selected results from the survey are presented in Appendix C. According to the survey results, most agency components had general Section 508 policies (over 50 percent), and Section 508 personnel (nearly 70 percent). Most components (over 90 percent) incorporated Section 508 requirements into their procurements for ICT in some way. Many components (nearly 58 percent) performed some type of evaluation and remediation on their websites. While the survey results indicated a good deal of the ICT used by federal agencies was accessible, it is not possible to determine from the survey how each agency's ICT was in compliance with Section 508 in any objective or uniform ways.

Even more 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 \$1.3 billion annually. This amount represents less than 2 percent of annual Federal ICT spending, which is in the range between \$88 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 \$106 million annually.

ES.5. Incremental Costs of the Rule

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



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

Costs for manufacturers to comply with the revised Section 255 guidelines relating to providing accessible electronic support documentation and services are also estimated. Collectively, the revised revisions to Section 508 and Section 255 have estimated compliance costs of \$182.4 million (sensitivity analysis range: \$121.0 million to \$285.7 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 will result from adoption of the final rule but could not be quantified. These costs are listed in Table ES-3.

Table ES-3. Unquantified Costs of the Final Rule

Costs
Possible increase in Federal Government costs 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.
Potential costs to state and local governments and non-profit organizations that may be required to make electronic content accessible in order to do business with federal agencies
Potential costs to develop and produce hardware and telecommunications products that comply with revised standards.
Possible increase in social costs to people with certain vision disabilities because they would have to use commercial screen magnification tools rather than turning off the style sheets (free of charge) in order to read web pages.
Costs of increased compliance by foreign telecommunications manufacturers shifted to U.S. end users (consumers).

Overall, we expect the 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 agency compliance will increase because the WCAG 2.0 standards provide a more detailed template for ensuring accessibility and because adopting these standards will 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 revisions to the Section 255 guidelines is more difficult to quantify. It is possible that manufacturers of ICT and telecommunications equipment may elect to spread the costs of compliance with the revised ICT standards and guidelines across all of their product lines. The potential impact on consumer prices can be assessed by assuming that these manufacturers will incur compliance costs equal to the entire amount estimated in this analysis for Federal agencies, contractors, and vendors (about \$182.4 million on an annualized basis) with the



aggregate value of annual shipments in these industries (about \$75.6 billion⁷). Under this conservative assumption, the incremental compliance costs incurred by computer and telecommunications equipment manufacturers will still be less than 0.3 percent of the value of their annual shipments.

ES.6. Conclusion

This evaluation indicates that the monetized costs of the final rule exceed the monetized benefits. The annualized costs for the revised Section 508 standards, net of the annualized benefits, represent about 9 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 final 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 determination that the benefits of the final rule of the Section 508 standards and Section 255 guidelines justify the costs.

⁷ See Table D-4 in Appendix D.



1. Introduction: 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.⁸ The term “information and communication technology” is used throughout the preamble and final 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.”⁹

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.¹⁰ The Access Board indicated in the 2010 ANPRM that it proposed to harmonize the revised Section 508 standards with the current

⁸ 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.

⁹ The Federal Communications Commission (FCC) establishes regulatory requirements for telecommunications equipment manufacturers using the Section 255 guidelines in whole or in part. 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.

¹⁰ The text of the 2010 ANPRM is available at <http://www.access-board.gov/attachments/article/560/draft-rule2010.pdf>.



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.¹¹ 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 2010 Access Board proposal, these requirements will 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 will 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 2.0.¹²

In February 2015, the Access Board issued an NPRM proposing updates to the existing Section 508 standards and Section 255 guidelines. The NPRM generally followed the overall structure and incorporation by reference of WCAG 2.0 as in the 2011 ANPRM, but made clarifications and certain changes, such as combining the Section 508 standards and Section 255 guidelines into a single set of requirements with three parts.¹³

Based on the comments to the two ANPRMs and the NPRM, the Access Board is adopting the WCAG 2.0 Success Criteria and Conformance Requirements by reference as the core set of requirements in the revised Section 508 standards and Section 255 guidelines. These standards apply 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 are supplemented with other consensus standards and guidelines that address specific ICT areas, including PDF accessibility and several standards applicable to telecommunications equipment.

The Access Board received comments relating to its proposal to require that ICT that provides real-time voice communication also support real-time text (RTT) functionality and ensure the compatibility of multiline displays and features capable of text generation. All of the commenters from international disability advocacy organizations spoke out in favor of the Access Board's proposed approach, as did most disability advocacy organizations and commenters from institutions of higher education and research. On the other side of the issue, most companies that addressed RTT rejected the approach as being too parochial and limiting. Accessibility experts were more mixed on the issue, with a majority supporting the approach, as did the standards organizations. Additionally, in April 2016, the FCC published an NPRM seeking comment on proposals to replace the FCC rules requiring support for text telephone (TTY) technology with rules requiring support for RTT technology. As the FCC is responsible for enforcing Section 255

¹¹ 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>.

¹² 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>.

¹³ The text of the 2015 NPRM is available at <https://www.gpo.gov/fdsys/pkg/FR-2015-02-27/pdf/2015-03467.pdf>.



and is not bound by the Access Board’s guidelines, the Access Board has decided to reserve the issue of RTT to be addressed in a future rulemaking after the FCC has completed action on this issue.

The final rule includes a so-called “safe harbor” provision that exempts existing (i.e., “legacy”) ICT from having to modify or upgrade to conform to the Revised 508 Standards so long as such ICT complies with the existing 508 regulations and is not “altered” after the compliance date (which is one year after publication of the final rule). “Alterations” consist of changes that materially affect the accessibility or usability of the covered hardware, software, or content (i.e., changes that affect interoperability, the user interface, or access to information or data). Importantly, the safe harbor provision in the Revised 508 Standards operates on an element-by-element basis; that is, each portion or component of the existing ICT is examined independently to assess the applicability of the safe harbor exemption. For example, assume a federal agency is making changes to the footer portion of its existing website through a content management system (CMS) two years from now. The new footer would need to conform to new requirements in the Revised 508 Standards, including WCAG 2.0 SC 1.4.3 for low contrast, but other existing page content managed through the CMS would not to be upgraded or revised (so long as otherwise compliant with the existing 508 Standards).



2. Framework to Evaluate the Revised ICT Standards and Guidelines

Econometrica was tasked with developing a regulatory evaluation of the benefits and costs of the requirements in the final rule. The impact of the revised 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 revised 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 revised and improved ICT accessibility standards.
- 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 will be affected by the need to comply with the revised standards.
- Develop estimates of current and projected future (“baseline”) Federal agency Section 508 compliance and the estimated costs to achieve this projected baseline level of compliance if the Section 508 standards are not revised.
- Identify provisions in the revised 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.¹⁴
- Develop estimates of the net increase in compliance costs that will result from adopting the revised Section 508 standards over a 10-year analysis period from 2018 through 2027.
- 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 revised standards and guidelines.

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

The rapid evolution of ICT devices, platforms, applications, and consensus standards complicates evaluation of the revised regulatory requirements. Therefore, the benefits and costs of the revised standards and guidelines ultimately depend not only on technologies that are currently available to

¹⁴ Additional costs may be incurred by telecommunications and network equipment manufacturers to comply with the updated Section 255 guidelines. However, we were not able to develop quantitative estimates of these compliance costs.



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.¹⁵ In addition to the current Section 508 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 1973.¹⁶

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) (hardware or software that increases or maintains functional capabilities of individuals with disabilities) such as screen readers. Other parts of Section 508 specify requirements applicable to software applications and operating systems (1194.21), telecommunications products (1194.23), video and multimedia products (1194.24), self-contained, closed products (1194.25), and desktop and portable computers (1194.26).

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.¹⁷

¹⁵ 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.

¹⁶ Section 508 accessibility standards, information on best practices, and links to training and technical support forums are available at www.section508.gov.

¹⁷ DOJ, "[Section 508 Report to the President and Congress: Accessibility of Federal Electronic and Information Technology](#)," September 2012.



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 with disabilities when such access is readily achievable.¹⁸ 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.¹⁹ 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.²⁰

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.”²¹ The FCC adopted regulations partly implementing Section 716 in its October 7, 2011, Report and Order and published additional regulations on April 29, 2013.

¹⁸ 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.

¹⁹ 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).”

²⁰ See FCC, “[Tentative Findings on Accessibility of Communications Technologies](#),” CG Docket No. 10-213, August 23, 2012.

²¹ The Section 716 requirements do not apply to equipment already covered under the Section 255 guidelines.



- 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.

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.²²

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.²³

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

- Information and user interface components must be presentable to users in ways they can **perceive**.
- User interface components and navigation must be **operable**.
- Information and the operation of user interface must be **understandable**.
- 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.²⁴ 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.

²² 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.

²³ 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.

²⁴ W3C provides [extensive guidance, examples, best practices, and resources](#) for complying with the WCAG 2.0 specifications.



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.²⁵ Foreign government Web site accessibility requirements are also typically defined by reference to, or are 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.²⁶

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.²⁷

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.²⁸

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

²⁵ ETSI, “[Accessibility requirements suitable for public procurement of ICT products and services in Europe](#),” EN 301 549 V1.1.1 (2014-02).

²⁶ Mark Rogers, “[Government Accessibility Standards and WCAG 2.0](#),” Power Mapper Software Blog, posted June 19, 2016.

²⁷ 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.

²⁸ See DOJ Disability Rights Office, “[A Guide to Disability Rights Laws](#),” last updated July 2009.



auxiliary aid to an individual with a disability, regardless of whether information on its website meets accessibility requirements under Section 508.²⁹

²⁹ HHS.gov, "[Clarification: Compliance with Sections 504 and 508 of the Rehabilitation Act.](#)"



4. An Overview of the Revised 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 many of the provisions of the current standards are not measurable 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 policies and practices that many Federal agencies now used to measure accessibility have evolved significantly from those specifically set forth in the published requirements.

The Access Board final rule updates and unifies 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 will 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 is 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, hearing, or learning 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 revised accessibility requirements was to identify and reference existing consensus standards directly wherever possible. Accordingly, the final rule updates 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 2.0.³⁰ 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:³¹
 - 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.
- 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

³⁰ A provision-by-provision comparison of the WCAG 2.0 and Section 508 standards is available on the Access Board Web site.

³¹ The preamble notes that “By applying a single set of requirements to websites, electronic documents, and software, the revised requirements adapt the 508 Standards to reflect the newer multifunction technologies (e.g., smartphones that have telecommunications functions, video cameras, and computer-like data processing capabilities) and address the accessibility challenges that these technologies pose for individuals with disabilities.”



WAI-published Mobile Web Best Practices/Mobile Web Applications Best Practices guidelines and the WCAG 2.0 standards.³²

- Adoption of new technologies and programming techniques has generated new accessibility obstacles that did not exist when the current Section 508 standards were developed.³³
- 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.³⁴
- 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).³⁵

In addition to the 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 will be accessible to people with disabilities.³⁶
- DOJ issued an ANPRM in 2010 indicating that the Department was considering revising the current ADA Titles II and III regulations. The Title III regulations would 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 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.³⁷

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.

³² 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.

³³ 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.

³⁴ 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.

³⁵ A new regulatory proceeding would be necessary to require that the Section 508 standards and Section 255 guidelines in the final rule be changed to reference future updates to any of these WAI-developed standards.

³⁶ 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.

³⁷ 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.



4.2. WCAG 2.0 and Other Revised Accessibility Standards: What Will 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-based intranet and internet information and software 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 17 WCAG 2.0 success criteria that could be considered “new” in the context of the current Section 508 standards. The majority of these are consistent with current industry practices or common ICT user expectations regarding accessibility:

- Six success criteria specify the organization and coding of Web pages and electronic content to ensure that the order and navigation are clear and consistent. Conformance to these success criteria is consistent with reasonable structure and presentation of electronic content for all audiences, rather than specifically for those with addressable disabilities.³⁸
- Four success criteria state common and recommended Web and software programming requirements.³⁹
- Two success criteria for handling forms and transactions can be incorporated into any ICT to improve accessibility.⁴⁰
- One success criterion provides all Web or multimedia users with the ability to control audio content that would otherwise be impossible to pause or interrupt so that those using screen readers can hear the relevant content visible to others.⁴¹

The remaining 4 of the 17 “new” WCAG 2.0 success criteria 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.⁴²

The final rule also incorporates references to other voluntary international consensus standards applicable to PDFs, 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 final rule text.

³⁸ The referenced WCAG 2.0 success criteria 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).

³⁹ The referenced WCAG 2.0 success criteria 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).

⁴⁰ The referenced WCAG 2.0 success criteria are the requirements relating to error suggestion and prevention (3.3.3 and 3.3.4).

⁴¹ The referenced WCAG 2.0 success criterion is the requirement relating to audio control (1.4.2).

⁴² The referenced WCAG 2.0 success criteria 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).



The final rule includes a so-called “safe harbor” provision that exempts existing (i.e., “legacy”) ICT from having to modify or upgrade to conform to the Revised 508 Standards so long as such ICT complies with the existing 508 regulations and is not “altered” after the compliance date (which is one year after publication of the final rule). “Alterations” consist of changes that materially affect the accessibility or usability of the covered hardware, software, or content (i.e., changes that affect interoperability, the user interface, or access to information or data). Importantly, the safe harbor provision in the Revised 508 Standards operates on an element-by-element basis; that is, each portion or component of the existing ICT is examined independently to assess the applicability of the safe harbor exemption. For example, assume a federal agency is making changes to the footer portion of its existing website through a content management system (CMS) two years from now. The new footer would need to conform to new requirements in the Revised 508 Standards, including WCAG 2.0 SC 1.4.3 for low contrast, but other existing page content managed through the CMS would not to be upgraded or revised (so long as otherwise compliant with the existing 508 Standards).

4.3. ICT Content, Applications, and Equipment: What Will 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 revised Section 508 standards and Section 255 guidelines 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. Revised requirements dealing with video accessibility for people with vision-related disabilities apply to displays on Web sites, software applications, and multifunction machines. Audio players on Web sites or on telecommunications products and desktop computers will need to provide accessible controls. AT compatibility requirements apply to all electronic devices defined as ICT.



4.3.1. Covered Categories of Electronic Content

Although the scoping definitions in the final rule apply to most ICT equipment and services covered under the current Section 508 requirements, the types of electronic content that fall under the purview of the revised standards are defined in more specific terms. The final rule provides the following 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 survey questionnaire;
 - g. A template or form;
 - h. Educational or training materials;
 - i. Intranet content designed as a Web page.

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 continue to be covered under the revised standards. Telecommunications equipment will be required to comply with the applicable WCAG 2.0-based requirements to the extent that the revised Section 255 guidelines are included in regulations issued by the Federal Communications Commission under section 255 of the Communications Act of 1934.

The final rule also incorporates technical specifications in addition to the WCAG 2.0 based requirements that are specifically applicable to software, hardware, and telecommunications equipment. Further information about individual WCAG 2.0 standards and the additional requirements for software, hardware, and telecommunications equipment is provided in Appendix A.



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

We identified 10 areas in which the revised 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/contrast settings and text resizing.
7. Audio control on Web pages.
8. User control for captions and video description.
9. ICT hardware accessibility.
10. Online product and service user support.

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

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

The final rule applies 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.⁴³

While WCAG 2.0 was developed specifically to address accessibility issues with Web-based content, forms, and applications, the preambles to the proposed and final rules explain the rationale for applying these standards to non-Web ICT.

To address concerns expressed by some commenters and the working group regarding the application of a few WCAG 2.0 Success Criteria to non-Web documents and non-Web software, in the final rule, the Access Board has excepted non-Web documents and non-Web software from compliance with these criteria. Specifically, non-Web documents and non-Web software need not comply with WCAG 2.0 Success Criteria 2.4.1 Bypass Blocks, 2.4.5 Multiple Ways, 3.2.3 Consistent Navigation, and 3.2.4 Consistent Identification. Additionally, the Access Board added new provisions to instruct the reader when applying WCAG 2.0 to non-Web documents and non-Web software to replace the term “Web page” with the term “document” or “software.” The Access Board added this exception and new provisions where applicable throughout the final rule text (final E205.4, E205.2.1, E207.2, E207.2.1, C203.1, C203.2.1, C205.2, 501.1, 504.2, 504.3, 504.4, and 602.3). The W3C has developed a working draft guidance document that provides support for

⁴³ 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 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.⁴⁴

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 final rule includes three additional sets of 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 will be required to provide a specified list of documented accessibility services, typically through the means of application programming interfaces (APIs).⁴⁵

4.4.3. Area 3: Authoring Tools

The revised standards for software accessibility 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.⁴⁶ The current Section 508 standards have no explicit requirements specifically relating to authoring tools. The revised standards require authoring tools to provide a mode of operation that allows users to create or edit WCAG 2.0-compliant content, preserve information required for accessibility, provide user prompts that proactively support the creation of accessible content, and provide a range of templates (where templates are provided) that facilitate the creation of accessible content. Any authoring tools that export PDF files are required to allow a user to comply with the International Standard for Accessible PDF Technology (PDF/UA-1). 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 AT such as screen readers, screen magnifiers, and joysticks to navigate and read electronic 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. The W3C developed and published the first consensus set of authoring tool accessibility guidelines (ATAG 1.0) in February 2000. A revised set of guidelines (ATAG 2.0) was finalized in 2015.⁴⁷ Some open-source authoring tools including Drupal, a content management system used to develop a large number of Federal Government

⁴⁴ 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 8, 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.”

⁴⁵ 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.”

⁴⁶ 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.

⁴⁷ W3C, “[Authoring Tool Accessibility Guidelines \(ATAG\) 2.0](#),” W3C Candidate Recommendation, September 24, 2015.



Web sites, have evaluated their conformance with ATAG 2.0. These evaluations have indicated that many elements of conformance have not yet been realized.⁴⁸ In addition, we were not able to identify currently marketed software applications that are able to claim conformance with the ATAG 2.0 criteria.

4.4.4. Area 4: Assistive Technology

Another 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, AT 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:⁴⁹

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

The current Section 508 standards have no explicit requirements for AT. 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 language in Subpart A, Section 1194.1 Purpose referencing “information and data” to include the documents and other forms of electronic content irrespective of whether or not these materials are available through a public-facing Web site.

The revised 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 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

⁴⁸ Drupal Groups, “[Drupal compliance overview of ATAG 2.0](#),” last updated August 15, 2011, last accessed September 12, 2016.

⁴⁹ National Center for Accessible Media, “[Accessible Digital Media Guidelines: Tools for Access](#).”



comprehensive “how to” portals and sites with best practices and guidance for the most common desktop software applications.⁵⁰

- 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 revised standards provide testable requirements for electronic content, software applications, and operating systems. In most cases, visual presentation of text and images of text are required to have a contrast ratio of at least 4.5:1 (SC 1.4.3).⁵¹

The current Section 508 standards do not address the ability of users to resize the display of text and other content. The revised standards require Web pages and non-Web user interfaces to be readable and retain their functionality when the text size is doubled (SC 1.4.4).⁵²

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.⁵³ The revised standards 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

⁵⁰ 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>.

⁵¹ 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).

⁵² 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.

⁵³ Web-embedded video and audio content often plays automatically without the user attempting to play it. The requirements in the final rule will 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.



available in any particular form or location. The final rule includes 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 final rule will 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 will have to be redesigned to feature the controls more prominently. Media players without these capabilities will 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 will 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. ICT Hardware Accessibility

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

The final rule requires 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.

4.4.10. Online Product and Service User Support

The final rule also includes revised 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 Revised ICT Standards and Guidelines: What Entities Will Have to Comply?

Section 508 specifically applies to most Federal departments and agencies, as well as the USPS.⁵⁴ A limited number of exemptions (the Government Accountability Office, the Federal Election Commission, and Government-owned, contractor-operated facilities) from Section 508 requirements have been retained under the Access Board proposal. The revised standards and

⁵⁴ 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 analysis.



guidelines 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.⁵⁵

The rule requirements also apply to ICT procured from Federal contractors and vendors.⁵⁶ 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 revised ICT standards and guidelines on these entities.⁵⁷ U.S. and foreign telecommunications equipment manufacturers whose products are sold in the U.S. market continue to be covered by the Section 255 guidelines under the final rule.

⁵⁵ For example, ICT that is used to support the business and administrative functions of these agencies is covered under the current and updated Section 508 standards.

⁵⁶ 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 updated Section 508 standards.

⁵⁷ 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 <https://www.section508.gov/content/learn/laws-and-policies/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 will decide to adopt the updated Section 508 standards. Therefore, we cannot estimate any costs that nonregulated parties will incur by voluntarily adopting the updated standards.



5. Significant Changes from the Preliminary Regulatory Impact Analysis to the Final Regulatory Impact Analysis

In response to comments and because of the availability of certain updated data, this final regulatory impact analysis (FRIA) differs from the PRIA in several significant ways:

- Benefits of the Final Rule:
 - Because the final rule has a 3-year, rather than a 2-year, implementation period, benefits from productivity increases due to adoption of the new Section 508 guidelines and Section 255 standards are assumed to reach full magnitude at the third year after increasing gradually over the first 2 years of implementation.
 - Increased the productivity benefit to Federal employees with vision disabilities as a consequence of additional studies found, resulting from research conducted in response to the comment from Jonathan Lazar, a Professor of Computer and Information Sciences at Towson University involved in research on Web accessibility for persons with disabilities.
 - Reduced the percentage of time lost on inaccessible Web sites for persons with vision disabilities in response to a comment from Professor Lazar.
 - Included time loss from inaccessible Web sites for persons with non-vision addressable disabilities, when responding to the comment from Professor Lazar, as a result of a study by the British Disabilities Rights Commission.
 - Added persons with learning/intellectual disabilities to the addressable disabilities population as a result of new functional performance criterion in the revised 508 standards that were included in response to public comments from persons with cognitive or language disabilities.
- Certain estimates have been revised (including more recent figures on numbers of Federal employees, more recent data on Federal procurement of certain ICT products, and more recent data on impacted telecommunications manufacturers), where applicable. Both incremental benefit and cost estimates are for a 10-year span starting in 2018 when the agencies will start to comply with the final rule.
- Incremental Cost Estimates of the Final Rule:
 - Additional Federal employees would need to be trained in Section 508 compliance.
 - A broader range of Federal employees would be required to make new electronic documents compliant with Section 508, rather than only IT staff or Section 508 offices, as assumed in the PRIA.
 - Estimated costs to agencies to install braille instructions on certain types of hardware with closed functionality and display screens have been included in this FRIA. These costs are composed of the cost of a braille instructions label and the cost to install a braille instructions label upon impacted hardware.
 - Costs for removal of the existing § 1194.22(d) requiring Web-based documents and information to be “organized so that they are readable without requiring an



associated style sheet” could not be quantified and are discussed in the unquantified costs section of this FRIA.

- o Removal of RTT analysis and discussion as a result of this provision not being included in the final rule.

Additionally, three scenarios of incremental benefits and costs are presented in their respective sections illustrating incremental benefits and costs of the rule using alternative parameters that are not based on published estimates (i.e., are assumptions made). These three scenarios include: a low net benefit (using parameters resulting which result in lower benefits and higher costs), an expected (consisting of expected values for assumed parameters), and a high net benefit (using parameters which result in higher benefits and lower costs). Where applicable, tables and text have additional columns corresponding to these scenarios, and parameters with sensitivity ranges have been noted in the text as such, and tables will show different values corresponding to the appropriate scenario.



6. Incremental Benefits of the Final Rule

The revised 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.⁵⁸ 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 revised Section 255 guidelines are intended to expand and improve the accessibility of telecommunications equipment to people with hearing, vision, learning, and fine motor skill disabilities.

6.1. Types of Addressable Disabilities and Number of Potential Beneficiaries

The functional performance criteria in Section 302 of the final rule identify nine types of physical disabilities and limitations that can be potentially addressed by ICT accessibility standards and guidelines. A Census Bureau report entitled “Americans with Disabilities: 2010” provides the following population estimates among individuals 15 years and older:⁵⁹

- 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 Survey of Income and Program Participation (SIPP)).
- 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).
- With learning or intellectual disabilities (about 5.1 million people).

The above categories are not mutually exclusive, so there is some overlap for persons with multiple disabilities. Additional information on these estimates can be found in Appendix B’s Table B-1.

⁵⁸ 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.

⁵⁹ SIPP estimates of the number of people with each type of disability in 2010 are shown in parentheses.



Different provisions and combinations of provisions in the revised requirements will 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 will 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) will also provide benefits to people with limited vision and those without perception of color, as well as people with cognitive, language, and learning disabilities.
- The technical standards in Section 412.2 through Section 412.4 (volume gain, magnetic coupling, interference, and ITU-T encoding) will benefit people who use AT to address hearing limitations.
- The Section 407 requirements relating to operable parts (e.g., the 407.4 key repeat and 407.6 operation requirements) will ensure the accessibility of ICT hardware and telecommunications equipment for people with motor skill limitations and people with cognitive, language, and learning disabilities, as will the platform accessibility standards in Section 502.4.
- 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 will 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.⁶⁰
- Users of telecommunications equipment with vision, hearing, speech, fine motor skill, cognitive, or learning disabilities will 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 final rule that will 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 will also benefit from more consistent implementation of the portions of the revised 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 revised Section 415 requirements for caption

⁶⁰ 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 according to [U.S. Census Bureau, "Americans with Disabilities: 2010, Household Economic Studies," issued July 2012.](#)



processing technologies supports the availability and display of captioning used by people without disabilities in noisy environments and those for whom English is not the native language.

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

- 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 will 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.⁶¹
- More universal adoption of the technical standards for ICT with two-way voice communication referenced above will 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 will increase comprehension, reduce requests for repetition, and decrease the potential for mishearing and misunderstanding of voice communications and speech output.⁶²

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.

6.2. Benefits for Federal Employees With Disabilities

Federal Government employees who have addressable disabilities will benefit from revised 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 revised Section 508 standards will depend on the nature of their jobs and the type and severity of their disabilities, as well as on the extent to which the revised 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 revised requirements referenced in Section 6.1 for people with the same types of disabilities (i.e., without vision, with limited vision, without perception of color, with cognitive, language, and learning disabilities, users of assistive technology, or with motor skill limitations).⁶³

⁶¹ The 2010 SIPP did not collect information on the number of people with vision limitations corrected by eyeglasses or contact lenses.

⁶² There were also about 3.4 million people in 2010 with no hearing difficulty only with use of a hearing aid.

⁶³ For example, a programmer without vision or with limited vision will benefit substantially from applying the WCAG 2.0 Level A and Level AA requirements to software, but this will provide no benefit to a program manager with difficulty hearing. Similarly, the Section 407.9 provision for operable controls will 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.



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 December 2015 U.S. Office of Personnel Management (OPM) data.⁶⁴
- The hourly wage was adjusted to take into account the cost of leave. The average full-time equivalent (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.⁶⁵
- 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.⁶⁶
- Revised 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 (sensitivity analysis range 0.5 percent [= 50 percent * 1 percent] to 2 percent [= 200 percent * 1 percent]).⁶⁷ The productivity improvement for

⁶⁴ OPM, [FedScope Employment Cube](#), December 2015.

⁶⁵ OPM, [Work Years and Personnel Costs, FY 2005](#), October 2008 (last report available).

⁶⁶ Ibid.

⁶⁷ 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 final rule, for workers with various types of disabilities. However general support for an estimate of this magnitude can be found in three European studies. In 2007, a study sponsored by the European Commission explored, from a quantitative perspective, differences in income and wage levels between workers with and without "long-standing health problems or disabilities" (LSHPD) in EU member states. See Applica et al., "Men and Women with Disabilities in the EU: Statistical Analysis of the LFS Ad Hoc Module and the EU-SILC," (April 2007) ("2007 EC/Applica Study"). This 2007 EC/Applica study found that, after controlling for differences in education, occupational characteristics, health, and other factors, there was a 10 percent wage differential between LSHPD and non-LSHPD workers. (See page 163 of 2007 EC/Applica Study.) A subsequent EC-sponsored study, using similar EU datasets, assessed the economic impact of improved Web accessibility via compliance with WCAG 2.0 on, among other things, relative wages of LSHPD and non-LSHPD workers. See Technosite, "Study on Economic Assessment for Improving eAccessibility Services and Products," SMART 2009-0072 (June 2012) ("2012 EC/Technosite Study"). This 2012 EC/Technosite Study looked at three scenarios concerning the effect of improved Web access on LSHPD to non-LSHPD wage differentials, with the mid-range scenario (scenario 2) assuming that improved Web accessibility would reduce the relative wage gap experienced by LHSPD workers by 10 percent. (See 2012 EC/Technosite Study, pp. 306 – 310.) Based on EU wage data from 13 countries, this study found that, on average, the ratio of LHSPD to non-LHSPD wages was 84.7 percent, meaning a wage differential of 15.3 percent. 2012 EC/Technosite Study, section 3.2 & Tbl. 49. Under the mid-range scenario (i.e., assuming that improved Web accessibility results in a 10 percent reduction in the LSHPD to non-LSHPD wage gap), the resulting wage increase to LSHPD workers is 11.8 percent $[(84.7\% + 10\%)/84.7\% - 1]$. Taken together, when this 11.8 percent estimated wage increase under Scenario 2 of the EC/Technosite study is combined with our assumption that the Revised 508 Standards will alleviate 10 percent of time lost due to frustrations with Web browsing/interaction, yields about a 1-percent productivity increase $[(11.8\% \text{ wage increase}) \times (10\% \text{ PRIA-assumed reduced frustration in Web use}) = 1.2\%]$.



people with vision disabilities resulting from the revised standards was assumed to be three times as large (3 percent). This result was derived as follows:

- o The McKinsey Global Institute estimates in its report entitled “The social economy: Unlocking value and productivity through social technologies” that knowledge workers spend 28 hours each week writing emails, searching for information, and collaborating internally.
- o About 70 percent of all Federal employees are knowledge workers.⁶⁸
- o The *average* Federal worker would spend around 20 hours per week (28 hours per week * 70 percent of all Federal employees are employed in knowledge work) searching for information on the Internet and using computer software (writing a report or working on a spreadsheet, etc.).
- o Lazar, Allen, Kleinman, and Malarkey (2007) find that blind participants reported losing, on average, 30.4 percent of time spent on the computer due to the frustration with situations from inaccessible/unusable Web pages and AT malfunctions. Other studies reached similar conclusions.⁶⁹
- o Compared to this study’s subject, Federal employees with visual impairment may face similar situations at their jobs—both in their dealings with Web sites and non-Web, computer software. However, unlike the study’s subjects who were given unfamiliar tasks, the Federal employees may be more familiar with the situations they face. As a result, Federal employees with visual impairment may not lose time

⁶⁸ Econometrica estimate based on analysis of data from [FedScope Employment Cube](#).

⁶⁹ 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 3 times easier for a control group of non-disabled users than for users who were blind or had low vision.

Econometrica and the Access Board recognize and believe it is important to explain the limitations of two studies that are being used in this final rule to monetize benefits estimates. The studies by Lazar et al. (2007) and the British Disability Rights Commission (2004) were both conducted at a time when the internet and ICT were significantly different than the present day. It is likely that that there are both new challenges and opportunities that have been created by the new state of ICT, the extent to which cannot be captured by using these studies. Econometrica acknowledges that this creates uncertainty around the manner in which the accessibility problems experienced by the two studies’ participants would still be present or mitigated today. However, the reports from these two studies are limited in that they do not provide specific information on the websites visited by the studies’ disabled users or the respective accessibility levels of the studied websites. Therefore, it is unclear exactly how much users’ reported difficulties would be mitigated by the changes being made in this final rule. Taken together, these limitations reveal the need for further research to better understand the nature of the problem, and to update the literature based on the current state of ICT. Finally, because the sample sizes of disabled users in these studies were relatively small, extrapolating benefits to all persons with addressable disabilities introduces uncertainty. That said, both the Access Board and Econometrica believe that the information in these studies is the best available data that can be used to monetize benefits estimates for the final rule, but encourages the public to bear in mind the limitations discussed here.



as much as the study subject. We assume that Federal employees with visual impairment lose 15 percent of time spent on the computer (= 50 percent * 30.4 percent of time spent on computer) (sensitivity analysis range: 7.5 percent [= 25 percent * 30.4 percent] to 30 percent [= 100 percent * 30.4 percent]).

- o Given the assumption that Federal employees spend 20 hours per week on the computer and on the Web, 3 hours per week (15 percent [sensitivity analysis range: 7.5 percent to 30 percent] of time spent on computer lost for Federal employees with visual impairment * 20 hours per week on average on computer and Web for Federal employees) is lost due to frustrations by Federal employees with visual impairments, or around 7.5 percent (sensitivity analysis range: 3.8 percent to 15 percent) of their working hours.
- o The revised Section 508 standards are assumed to alleviate half (50 percent) (sensitivity analysis range: 25 percent to 100 percent) of the lost frustration hours due to inaccessible Word documents, database programs, presentation software, and spreadsheet programs, which account for the majority of minutes lost due to user frustration.⁷⁰
- o Web sites have higher accessibility compliance as more accessibility has been undertaken for web sites, and the revised standards will reduce minutes lost to Web browsing and other Internet use by 10 percent (sensitivity analysis range: 5 percent to 20 percent).
- o Applying a percentage of 43 percent (i.e., a weighted average calculated as: [5 times time loss to software frustration * 50 percent (sensitivity analysis range: 25 percent to 100 percent) lost frustration hours to software + 1 times time loss to Web browsing * 10 percent (sensitivity analysis range: 5 percent to 20 percent) lost frustration hours to Web browsing] / [5 + 1]) to the 7.5-percent (sensitivity analysis range: 3.8 percent to 15 percent) time-loss estimate yields the productivity estimate of approximately 3 percent (sensitivity analysis range: 0.8 percent to 13 percent).
- 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.

Table 1 presents low benefit, expected, and high benefit estimates of the potential increase in Federal employee productivity from improved ICT accessibility that was developed using this approach.

⁷⁰ A study utilizing time diaries for 50 workplace users found that time lost to frustrations with word processing, video/audio software, presentation software, and spreadsheet programs was more than 5 times as high as time lost to frustration with Web browsing and other Internet use. Given that the updated Section 508 standards include new software, spreadsheet, and word processing provisions of benefit to people with vision disabilities, this would increase their benefits beyond the benefits provided by increased Web site accessibility. See Lazar, J, A. Jones and B. Shneiderman, "[Workplace user frustration with computers: an exploratory investigation of the cause and severity](#)," *Behaviour & Information Technology*, 25(3), pp. 239–251, 2006



Table 1. Value of Increased Federal Employee Productivity, 2015

Estimate Component	Low Benefit Scenario	Expected Scenario	High Benefit Scenario
Average Federal employee salary*	\$80,266	\$80,266	\$80,266
Number of hours in FTE year	2,080	2,080	2,080
Average hourly wage for Federal employee	\$38.59	\$38.59	\$38.59
Average number of working hours**	1,760	1,760	1,760
Leave-adjustment multiplier	1.18	1.18	1.18
Hourly wage adjusted for leave	\$45.61	\$45.61	\$45.61
Benefit multiplier***	1.30	1.30	1.30
Fully loaded cost per employee hour of work	\$59.29	\$59.29	\$59.29
Average number of working hours	1,760	1,760	1,760
Assumed percent increase in productivity for an employee with a non-vision disability	0.5%	1%	2.0%
Hour-equivalent of increased productivity for an employee with a non-vision disability	8.8	17.6	35.2
Value of annual increased productivity per employee with a non-vision disability	\$522	\$1,043	\$2,087
Assumed percent increase in productivity for an employee with a vision disability	0.8%	3%	13.0%
Hour-equivalent of increased productivity for an employee with a vision disability	14.1	52.8	228.8
Value of annual increased productivity per employee with a vision disability	\$835	\$3,130	\$13,565

*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 \$1,043 (sensitivity analysis range: \$522 to \$2,087) 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 \$3,130 (with sensitivity estimates between \$835 and \$13,565).

Estimates of the FY 2010 numbers of Federal employees with specific types of disabilities who could potentially be more productive with revised ICT accessibility standards are presented and discussed in Section B.3 of Appendix B. Table 2 presents estimates of the total number of Federal employees with vision disabilities and other addressable disabilities.⁷¹

Table 2. Number of Federal Employees With Addressable Disabilities

Estimate Component	Vision Disabilities	Other Addressable Disabilities	All Addressable Disabilities
Civilian employees with addressable disabilities	9,486	27,814	37,300
Total Federal civilian workforce	2,108,639	2,108,639	2,108,639

⁷¹ 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.



Estimate Component	Vision Disabilities	Other Addressable Disabilities	All Addressable Disabilities
Percentage of total civilian workforce	0.4%	1.3%	1.8%

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

The average per-person value of productivity improvements and estimated numbers of employees potentially benefitting from the final 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 will not be realized immediately upon the revised standards taking effect. For this analysis, we have assumed that one-third of the recurring annual accessibility improvement from the rule standards would be realized in the first year (2018) and two-thirds in the second year (2018) of the 10-year analysis period.⁷²

Table 3. Estimated Benefits From Increased Productivity of Federal Employees With Addressable Disabilities

Estimate Component	Low Benefit Scenario		Expected Scenario		High Benefit Scenario	
	2018	2018–2027	2018	2018–2027	2018	2018–2027
Federal employees with vision disabilities	9,486	94,860	9,486	94,860	9,486	94,860
Value of annual increase in productivity per employee*	\$278	\$751	\$1,043	\$2,817	\$4,522	\$12,208
Federal employees with other addressable disabilities	27,814	278,140	27,814	278,140	27,814	278,140
Value of annual increase in productivity per employee**	\$174	\$470	\$348	\$939	\$696	\$1,878
Total productivity benefits	\$7,476,655	\$201,869,680	\$19,572,490	\$528,457,217	\$62,240,878	\$1,680,503,717
Present value of benefits in 2017 (millions)***		\$128.1		\$335.3		\$1,066.1

*Assumed Expected increases of \$1,043 in 2018, \$2,087 in 2018, and \$3,130 thereafter.

**Assumed Expected increases of \$348 in 2018, \$696 in 2018, and \$1,043 thereafter.

***Present value of 2018–2027 benefits calculated using a discount rate of 7 percent.

⁷² All 2018–2027 dollar values shown in this table and throughout the evaluation are in 2017 (i.e., inflation-adjusted) dollars.



Table 3 indicates that the final rule is estimated to increase the productivity of Federal employees with addressable disabilities by \$19.6 million in 2018 (sensitivity estimates of \$7.5 million and \$62.2 million) and \$528.5 million (sensitivity estimates of \$201.9 million and \$1.7 billion) over the 10-year analysis period from 2018 through 2027, the first 10 years after the revised 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.⁷³

In addition, some State and local government employees with addressable disabilities may benefit indirectly from the final 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 this regulatory evaluation.

6.3. 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.⁷⁴ (However, persons with disabilities may use or require these services at a greater rate than the general public if such persons are more likely to search for specific accessibility information on the web than in other areas; in which case the figures in the table may be underestimates of their usage.)

⁷³ Data on the number of contractor employees and the incidence rate of various disabilities among the contractor workforce could not be located for this analysis. Some Federal contractors and vendors are required to collect these data under Section 503 regulations published by the Department of Labor on September 24, 2013.

⁷⁴ 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.



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.⁷⁵ Increased Web accessibility provides several opportunities for time savings to a person with an addressable disability by:

- 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.

⁷⁵ 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 Services 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 updated 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.



- The extent to which bringing these sites into compliance with the revised standards reduces the amount of time to achieve their purpose for visiting a Federal Web site.

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

Persons with all types of addressable disabilities are expected to experience significant benefits from improved accessibility of Federal Web sites, and this regulatory assessment formally estimates time savings and monetizes benefits from such improvements. The methodology used to estimate time savings and monetize benefits for such individuals are described below.

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 assessment, an online adult with a vision disability was assumed to visit Federal Government Web sites an average of 15 times annually.⁷⁶ The average duration 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.⁷⁷

A 2007 study that used a non-randomized sample of Internet users who are blind concluded that 18 percent of the time spent online is lost to accessibility problems with current Web sites.⁷⁸ 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. This means that the extent of improvement in accessibility that can be expected from the final rule is less than what would be anticipated from making a previously noncompliant site fully accessible. For this assessment, the extent of improvement—measured in the form of the time savings for site visitors who use a screen reader—was estimated to be 20 percent of what would be realized for making a completely

⁷⁶ 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 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 do 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.

⁷⁷ 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 (www.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.

⁷⁸ 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. Jonathan Lazar commented that the 30-percent time-loss estimate in the PRIA included sources of frustration beyond those caused by inaccessible Web sites. Examples of this were frustrations from using old versions of AT and screen reader crashes. Econometrica reexamined the study and determined that around 40 percent of frustrations were due to failures that could not be remediated by enhancing Web site accessibility, while the remaining 60 percent of failures could be remediated. Applying this 60-percent share to the original 30-percent time-loss estimate yields the revised time-loss estimate of 18 percent.



noncompliant Web site fully accessible. 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. This 20-percent improvement in accessibility is consistent with an average compliance rate of 96 percent (that is a 20 percent increase over the existing 80 percent compliance rate) under the final 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.⁷⁹

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.

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*	18%
Estimated percent improvement in accessibility from revised 508 standards	20%
Percent of total time on Federal Government Web sites saved from accessibility improvement	3.6%
Hours saved per person from accessibility improvement	0.036

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

Estimating the numbers of people with vision disabilities who will benefit from more accessible Federal Government Web sites required several sets of calculations:⁸⁰

- *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 0.3 percent annually from 2010 through 2027, while the population of people age 65 and over is expected to increase by 3.3 percent annually.⁸¹ We assumed that the numbers of people in each age group with vision disabilities will increase at the same rate as the general population in the same age group. (We use these figures to forecast out to 2027 the number of people age 15 to 64 with vision disabilities and the number of people age 65 and over with vision disabilities, using the estimates in years 2018 to 2027 for analysis of benefits of the final rule.)

⁷⁹ 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 updated standards.

⁸⁰ The data used to develop these estimates are presented and discussed in Sections B.1 and B.2 of Appendix B.

⁸¹ The 2014–2027 estimates are derived from the Census Bureau, [2014 National Population Projections](#), “[Table 1. Projected Population by Single Year of Age, Sex, Race, and Hispanic Origin for the United States: 2014 to 2060.](#)” The 2010–2014 estimates were obtained from the Census Bureau, “[Annual Estimates of the Resident Population by Single Year of Age and Sex for the United States: April 1, 2010 to July 1, 2014 – 2014 Population Estimates.](#)”



- *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 non-disabled counterparts age 15 to 64 and 30 percent lower for non-disabled counterparts age 65 and over. In other words, 52.4 percent of people with addressable disabilities age 15 to 64 were online, while 22.2 percent of those with addressable disabilities age 65 and over were online.
- *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 2018 to 2027.⁸²
- *Time saved from increased accessibility*: The time savings per person estimated in Table 5 (0.036 hours annually, except in 2018, where the time savings was assumed to be one-third of 0.036 hours [i.e., 0.012 hours] and in 2019, where the time savings was assumed to be two-thirds of 0.036 hours [i.e., 0.024 hours], to account for a gradual ramp-up in productivity benefits) 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 Will Benefit From Improved Government Web Site Accessibility and Amount of Time Saved

Estimate Component	2018	2018–2027
People with vision disabilities online who visit Federal Government Web sites, age 15–64	2,173,680	23,656,045
People with vision disabilities online who visit Federal Government Web sites, age 65 and over	1,483,377	21,330,381
People with vision disabilities online who visit Federal Government Web sites, age 15 and over	3,657,056	44,986,426

⁸² 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 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).



Estimate Component	2018	2018–2027
Average annual hours saved from accessibility improvement*	0.012	0.033
Total hours saved by people with vision disabilities who visit Federal Government Web sites	43,885	1,485,851

*Assumed savings of 0.012 hours in 2018, 0.024 hours in 2019, and 0.036 hours thereafter for people with vision disabilities.

According to these estimates, there will be about 3.7 million people in 2018 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 hour of time saved.⁸³ 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. This \$10 value per hour assumption should be considered conservative.⁸⁴

Table 7 presents the calculations of the monetized value of the time savings from improved government Web site accessibility.⁸⁵

⁸³ 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, will instead conduct their business online. Depending on the agency and type of transaction at issue, these 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).

⁸⁴ First, the average hourly “base” wage for all workers on which the DOJ assumption was based is now 6 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 (2014). 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. More recent values could not be located.

⁸⁵ As in the Federal employee benefits analysis, one-half of the accessibility improvements resulting from the updated standards are assumed to be made in each of the first 2 years (2015 and 2016) of the 10-year analysis period.



Table 7. Monetized Benefits of Improved Government Web Site Accessibility to Persons with Vision Disabilities

Estimate Component	2018	2018–2027
Total hours saved by people with vision disabilities online who visit Federal Government Web sites (from Table 6)	43,885	1,485,851
Value of time saved per hour	\$10	\$10
Total value of time saved	\$438,847	\$14,858,510
Present value of benefits in 2017 (millions)*		\$9.23

*Present value of 2018–2027 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 \$0.4 million in 2018 and \$14.9 million over the 10-year analysis period from 2018 through 2027.

6.3.2. 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) will also be expected to accrue substantial benefits from improved accessibility of Federal Web sites brought about by the final rule. For example, expected benefits from improved Federal Web site accessibility will be experienced by people with hearing impairments or learning disabilities 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, some video and audio files posted on Federal Web sites are uncaptioned, rendering such content inaccessible. The revised Section 508 standards 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 are likely to 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.⁸⁶ People with hearing impairments will 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

⁸⁶ 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 video plays (or downloads) by users of Federal Web sites.



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.⁸⁷ The revised 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, ensure greater navigability, functionality, and usability of Federal Web sites and forms for persons with dexterity and mobility disabilities. Design features targeted to Web site users who are blind will 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.⁸⁸

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 7.9 million people age 15 to 64 and 2.4 million people age 65 and over with non-vision addressable disabilities will be expected to benefit in 2018.⁸⁹

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 will 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.⁹⁰ 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.⁹¹

Using this study, an estimate of time savings was developed 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,

⁸⁷ 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.

⁸⁸ Jonathan Lazar & Paul Jaeger (2011), “[Reducing Barriers to Online Access for People with Disabilities](#),” *Issues in Science and Technology* 17(2), p. 75.

⁸⁹ See also discussion in Appendix B-2.

⁹⁰ Disability Rights Commission, Web Access and Inclusion, pp. 24–25.

⁹¹ *Ibid.* at p. 25 and Table 1.



people with other addressable disabilities will be expected to experience one-third of the time loss (i.e., 6 percent) from inaccessible Web sites as people with vision disabilities.

Table 8 shows the calculation of the time savings for people with other addressable disabilities.

Table 8. Number of People With Other Addressable Disabilities Who Will Benefit From Improved Government Web Site Accessibility and Amount of Time Saved

Estimate Component	2018	2018–2027
People with other addressable disabilities online who visit Federal Government Web sites, age 15–64*	7,917,406	86,164,733
People with other addressable disabilities online who visit Federal Government Web sites, age 65 and over*	4,530,049	65,140,345
People with other addressable disabilities online who visit Federal Government Web sites, age 15 and over*	12,447,455	151,305,077
Average annual hours saved from accessibility improvement*	0.004	0.011
Total hours saved by people with other addressable disabilities online who visit Federal Government Web sites	49,790	1,664,150

* Data from Appendix B, Table B-1.

**Assumed to be one-third of the savings for people with vision disabilities.

People with other addressable disabilities will, under this approach, save an estimated 50,000 hours in 2018 from improved accessibility of Federal Web sites and a total of 1.7 million hours over the 10-year time horizon of the final 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 will be about \$498,000 in 2018 and \$16.6 million over the 10-year analysis period. These values are shown in Table 9.

Table 9. Monetized Benefits of Improved Government Web Site Accessibility to Persons with Other Addressable Disabilities

Estimate Component	2018	2018–2027
Total hours saved by people with other addressable disabilities	49,790	1,664,150
Value of time saved per hour	\$10	\$10
Total value of time saved	\$497,898	\$16,641,502
Present value of benefits in 2015 (millions)***		\$10.35

***Present value of 2018-2027 benefits calculated using a discount rate of 7 percent.

6.4. Benefits for Federal Agencies

Federal agencies may also realize some long-term cost savings associated with implementing the revised standards and guidelines. Web sites could be more readily maintained and revised 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.⁹²

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 will 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 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.
- These individuals are assumed to make an average of two calls annually (sensitivity range: 1 to 3 calls annually) to Federal Government agencies, and 20 percent of these calls each year could be avoided by improvements in Web site accessibility (except in 2018, where one-third of 20 percent [i.e., 7 percent] of these calls would be avoided, and in 2018, where two-thirds of 20 percent [i.e., 13 percent] of these calls would be avoided, to allow for a gradual ramp-up in lowered call volumes).⁹³
- 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.⁹⁴

Table 10 shows the calculation of these cost savings to Federal agencies from reduced call volumes.

⁹² W3C, WAI, "[Developing a Web Accessibility Business Case for Your Organization](#)," updated September 7, 2012.

⁹³ A sensitivity analysis was conducted to estimate benefits with higher (three per year) and lower (one per year) average annual numbers of calls.

⁹⁴ Econometrica, Inc., "[Final Regulatory Analysis on the Final Rule on Accessible Kiosks and Web Sites](#)," October 23, 2013.



Table 10. Estimated Benefits to Federal Agencies From Reduced Call Volumes

Estimate Component	Low Benefit Scenario		Expected Scenario		High Benefit Scenario	
	2018	2018–2027	2018	2018–2027	2018	2018–2027
Adults with vision disabilities online who visit Federal Government Web sites	3,657,056	44,986,426	3,657,056	44,986,426	3,657,056	44,986,426
Adults with other addressable disabilities online who visit Federal Government Web sites	12,447,455	151,305,077	12,447,455	151,305,077	12,447,455	151,305,077
Assumed annual number of calls per person	1	1	2	2	3	3
Percentage reduction in calls from improved Web site accessibility*	7%	18%	7%	18%	7%	18%
Total reduction in calls	1,073,634	35,990,565	2,147,268	71,981,131	3,220,902	107,971,696
Cost savings per avoided call	\$3.43	\$3.43	\$3.43	\$3.43	\$3.43	\$3.43
Total savings from reduced call handling	\$3,682,565	\$123,447,639	\$7,365,130	\$246,895,279	\$11,047,695	\$370,342,918
Present value of benefits in 2017 (millions)**		\$76.8		\$153.5		\$230.3

*Assumed reductions of 6.7 percent in 2018, 13.3 percent in 2019, and 20 percent thereafter, making the average percent reduction over 2018 through 2027 18 percent.

**Present value of 2018–2027 benefits calculated using a discount rate of 7 percent.

Table 10 shows that reduced call volumes from improved ICT accessibility could be expected to save Federal agencies \$7.4 million in 2018 (sensitivity analysis values of \$3.7 million to \$11.0 million) and \$246.9 million over the 10-year analysis period from 2018 through 2027.



Additional savings will 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 revised ICT standards may result in improved agency compliance over time. OMB recently released a strategic plan for addressing current Section 508 compliance shortfalls, which were attributed to three primary factors: understanding and applying standards, defining and measuring program success, and developing the workforce.⁹⁵ The final rule will 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 will 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 will find it easier to develop performance metrics that are consistent across affected entities.
- Finally, employees with significant Section 508 compliance responsibilities will have increased access to external classroom, library, and online resources.

6.5. 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 Telecommunications Relay Services—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 for people using American Sign Language.

Adequate data and information that can be used to quantify the potential benefits of the revised 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 final rule will also lead to improvements in the accessibility of electronic documentation and support services provided for telecommunications products. Users with various types of disabilities will 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 will 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

⁹⁵ OMB, “[Strategic Plan for Improving Management of Section 508 of the Rehabilitation Act](#),” January 24, 2013.



internationally recognized technical standards.⁹⁶ Similar benefits will be likely to 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.⁹⁷

6.6. 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 revised Section 508 standards 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:⁹⁸

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

6.7. Summary of Benefits

The benefits monetized in this analysis include benefits to Federal employees with vision and other addressable disabilities from increased productivity, benefits to citizens and other residents with vision and other addressable disabilities from time savings from more accessible Federal government web sites, and benefits to Federal agencies from public calls to Federal agencies avoided from more accessible web sites.

The value of the monetized benefits estimated in this assessment was calculated over a 10-year analysis period (assumed to be from 2018 through 2027) and converted into annualized values using 7-percent and 3-percent discount rates. These estimates are presented in Table 11.⁹⁹ These

⁹⁶ 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).

⁹⁷ Ibid.

⁹⁸ 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.

⁹⁹ A table showing the estimated benefits in each year of the 10-year analysis period is provided in Appendix E.



estimates do not include benefits from increased employment of people with Section 508-addressable disabilities, nor do they include benefits from being able to substitute for calls, mail, and in-person visits online or the value of cost savings from avoided office visits and mail correspondence.

Table 11. Annualized Value of Monetized Benefits, 2018–2027 (Millions of 2017 Dollars)

Monetized Benefit Component	Low Benefit Scenario		Expected Scenario		High Benefit Scenario	
	7-Percent Discount Rate	3-Percent Discount Rate	7-Percent Discount Rate	3-Percent Discount Rate	7-Percent Discount Rate	3-Percent Discount Rate
Benefits to Federal employees*	\$18.2	\$19.3	\$47.7	\$50.6	\$151.8	\$160.9
Benefits to people with addressable disabilities**	\$2.8	\$3.0	\$2.8	\$3.0	\$2.8	\$3.0
Benefits to Federal agencies***	\$10.9	\$11.7	\$21.9	\$23.4	\$32.8	\$35.1
Total annualized monetized benefits	\$32.0	\$34.0	\$72.4	\$77.0	\$187.4	\$199.0

The annualized value of monetized benefits expected to result from implementation of the revised Section 508 standards during the 10-year analysis period is estimated at \$72.4 million using a 7-percent discount rate (sensitivity analysis range of \$32.0 million to \$187.4 million) and \$77.0 million using a 3-percent discount rate (sensitivity analysis range of \$34.0 million to \$199.0 million).

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 12.

Table 12. Unquantified Benefits of the Final Rule

Benefits
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.



Benefits

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.

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.

Cost savings to Agencies already complying with current Section 508 standards for complying with the equivalent WCAG 2.0 standards because of the availability of WCAG 2.0 support materials.

The estimates and analysis presented in this section indicate that the final rule will 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.



7. 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 assessment was to develop estimates of current levels of Section 508-related expenditures for in-house and for procured products and services to comply with Section 508. Our starting point for estimating the in-house “baseline costs” for Federal agencies is a compilation of self-reported data on Section 508 compliance activities and achievements collected in a recent DOJ survey.^{100,101} The survey requested data in four areas: general processes for implementing Section 508, procurement policies, administrative complaints and civil actions, and subjective assessment of Web site compliance. Selected results from the survey are presented in Appendix C.

According to the survey results, most agency components had general Section 508 policies (over 50 percent), and Section 508 personnel (nearly 70 percent). Most components (over 90 percent) incorporated Section 508 requirements into their procurements for ICT in some way. Many components (nearly 58 percent) performed some type of evaluation and remediation on their websites. While the survey results indicated a good deal of the ICT used by federal agencies was accessible, it is not possible to determine from the survey how each agency’s ICT was in compliance with Section 508 in any objective or uniform ways.

Because of the above, to develop a baseline from which to evaluate the impacts of the final rule we used cost data from the DOJ survey and other data sources to develop estimates for five specific categories of costs that Federal agencies currently incur to comply with the existing Section 508 standards:

- Policy development and implementation;
- Employee training;
- Software, Web, and audiovisual media development;
- Software, Web sites, and audiovisual media evaluation; and
- Electronic document creation.¹⁰²

The in-house cost estimates for the five categories are presented in Section 7.1. The aggregate estimate of in-house costs was then 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 7.2). In developing the baseline costs related to implementing Section 255 guidelines, we reviewed available data to develop an estimate of the current annual costs for telecommunications manufacturers to produce accessible product documentation and support

¹⁰⁰ DOJ, “[Section 508 Report to the President and Congress: Accessibility of Federal Electronic and Information Technology](#),” September 2012.

¹⁰¹ This report is based on Agency self-reports, and as such, may not reflect actual rates of compliance with Section 508 standards.

¹⁰² In the DOJ survey, the category of costs corresponding to electronic document creation also included document repair costs. Because the ICT final rule no longer includes an electronic document remediation provision, this section has been removed from this FRIA.



materials (see Section 7.3). Finally, the aggregate baseline costs of complying with the Section 508 standards and Section 255 guidelines are presented in Section 7.4.

It should be noted by the reader that Federal Agencies achieve greater Section 508 compliance with the equivalent dollar amounts as time goes on: as Agencies gain more experience, we expect compliance to improve over time. These baseline costs assume this is the case for entities impacted by the final rule, and as such, the incremental costs of the final rule outlined in subsequent sections of this FRIA reflect solely the impacts of the final rule.

7.1. Federal Agency In-House Baseline Costs

7.1.1. 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 13.¹⁰³

Table 13. 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.

7.1.2. 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. An estimate of baseline Section 508 compliance training costs was developed using the following assumptions:

¹⁰³ 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.



- According to the Federal employment data presented in Table D-3 of Appendix D, there were 82,801 Federal employees in IT occupations in 2015. These employees were assumed to receive an average of 2 hours of training annually related to Section 508 compliance.¹⁰⁴
- There were 5,271 Federal employees in document/content production occupations that will have Section 508 compliance responsibilities. These occupations include roles in audiovisual production, writing and editing, technical writing and editing, visual information, and editorial assistance. These employees were assumed to receive an average of 2 hours of training annually.
- There were 41,376 Federal employees in contracting-related occupations in 2015. These employees were assumed to receive an average of 1 hour of training annually.
- There were 69,043 Federal employees in selected other occupations such as human resource management occupations or Equal Employment Opportunity (EEO) compliance occupations, that are likely to have responsibilities for Section 508 compliance. 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.¹⁰⁵ For the baseline cost estimate, direct training costs for these employees 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 14.

Table 14. Annual Baseline Cost of Federal Employee Training

Estimate Component	Number
Number of employees requiring training	
IT	82,801
Document/content producer	5,271
Contracting	41,376
Other selected occupations	69,043
Total number of employees	198,491
Direct expense per employee	\$100

¹⁰⁴ 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 occupations may not receive any training at all.

¹⁰⁵ 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).



Estimate Component	Number
Direct expense of training (1)	\$19,849,100
Average hourly wage	
IT	\$46.95
Document/content producer	\$40.50
Contracting	\$41.15
Other selected occupations	\$43.10
Value of trainee time	
IT (2 hours each)	\$7,775,762
Document/content producer	\$426,963
Contracting (1 hour each)	\$1,702,720
Other selected occupations (1 hour each)	\$2,975,849
Indirect cost of trainee time	\$12,881,294
Multiplier to account for benefits	1.54
Loaded cost of trainee time (2)	\$19,893,965
Baseline training cost (1) + (2)	\$39,743,065

*Cost numbers are calculated by rounded wage numbers.

Direct training costs for Federal employees are estimated at approximately \$19.8 million annually, and the value of employee time spent receiving training is estimated at approximately \$19.9 million annually. Total baseline costs for Section 508 compliance training of Federal employees are estimated to be \$39.7 million annually.

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

An 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 and modify applications or system software were assumed to devote time to ensuring that the software they develop and modify is Section 508 compliant.¹⁰⁶
- Federal IT employees who are Web developers were assumed to devote time to developing and modifying Section 508-compliant Web sites, forms, and applications.¹⁰⁷
- Federal audiovisual production employees were assumed to devote time to developing and modifying Section 508-compliant audiovisual media.
- The average Federal employee works 1,760 hours annually, net of holiday, annual, and sick leave.¹⁰⁸

¹⁰⁶ 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 of private sector IT employees calculated using the Bureau of Labor Statistics (BLS) data in Table D-5.

¹⁰⁷ The percentage of Federal IT employees who are Web developers was assumed to be equal to the percentage of private sector IT employees calculated using the BLS data in Table D-5.

¹⁰⁸ OPM, “[Federal Civilian Workforce Statistics: Work Years and Personnel Costs, FY 2005](#),” October 2008 (most recent report available).



- 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.¹⁰⁹
- Direct wage costs were multiplied by a factor of 1.54 to account for benefits and other non-wage compensation.¹¹⁰

Baseline cost estimates based on these data and assumptions are presented in Table 15.

Table 15. Annual Baseline Cost of Software/Web/Audiovisual Media Accessibility Compliance

Estimate Component	Software Development	Web Development	Audiovisual Production	All Applications
Number of employees	24,460	2,730	1,109	28,300
FTE work hours per year*	43,050,341	4,805,009	1,951,840	49,807,190
508-compliance hours per year**	2,152,517	240,250	97,592	2,490,360
Average annual salary	\$104,425	\$86,090	\$86,009	\$101,935
Direct cost per hour	\$50.20	\$41.39	\$41.35	\$49.01
Loaded cost per hour	\$77.54	\$63.92	\$63.86	\$75.69
Baseline 508-compliance cost	\$166,897,818	\$15,357,320	\$6,232,419	\$188,487,557

Sources: BLS Occupational Employment Statistics (May 2015) and Federal Employment Cube Data

*Based on average work hours of 1,760 annually.

**Assumed to be 5 percent of total employee work time.

Note: Some numbers do not add up to total because of rounding.

The current baseline costs for ensuring accessibility of software, Web, and multimedia developed by Federal IT employees are estimated at \$188.5 million annually.

7.1.4. 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 create and modify. 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:

¹⁰⁹ 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.

¹¹⁰ The 1.54 multiplier is composed of a 1.3 fringe benefit multiplier and a 1.18 leave adjustment multiplier assuming 1,760 working hours (out of a possible 2,080 working hours) per year.



- 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.¹¹¹

Baseline cost estimates developed using these data and assumptions are presented in Table 16.

Table 16. Annual Baseline Cost of Software/Web/Audiovisual Media Evaluation

Estimate Component	Software Evaluation	Web Evaluation	Audiovisual Evaluation	All Applications
Hours per year for incorporating accessibility into software, web, and audiovisual media (from Table 3)	2,152,517	240,250	97,592	2,490,360
Percentage hours for 508-compliance testing and evaluation	25%	25%	25%	25%
508-compliance testing and evaluation hours per year	538,129	60,063	24,398	622,590
Loaded hourly wage rate	\$77.54	\$63.92	\$63.86	\$75.69
Baseline 508-compliance testing/evaluation cost	\$41,724,454	\$3,839,330	\$1,558,105	\$47,121,889

Note: Some numbers do not add up to total because of rounding.

The baseline costs for evaluating and testing the accessibility of the software, Web, and multimedia ICT developed by Federal employees are estimated at \$47.1 million annually.

7.1.5. Creation 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.¹¹² Two distinct groups of content are covered by the update of the 508 standards: (1) all public-facing Federal content and

¹¹¹ 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 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.

¹¹² 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.



(2) non-public-facing electronic content covered by nine categories of official agency communications. The nine categories of non-public official agency communications are (1) emergency notifications, (2) initial or final decisions adjudicating an administrative claim or proceeding, (3) internal or external program or policy announcements, (4) notices of benefits, program eligibility, employment opportunity, or personnel action, (5) formal acknowledgements of receipt, (6) survey questionnaires, (7) templates and forms, (8) educational and training materials, and (9) intranet content designed as a Web page. The first eight categories are retained from the proposed rule while the ninth category was added into the final rule text.

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

- The 198,491 Federal employees in the occupations described earlier in Section 7.1.2 (See Table 14 or D-3), such as IT-related occupations and Contracting-related occupations, spend at least some time creating Section 508-compliant electronic documents.
- The average Federal employee works 1,760 years annually, net of holiday, annual, and sick leave.

Two additional assumptions are made regarding the percentage of time required to ensure that electronic document creation is Section 508 compliant and the average hourly wage of employees conducting these activities. These assumptions are made based on more detailed use-of-time estimates from two IDC studies of IT and “knowledge” workers, which include the following results:

- About half of the time knowledge workers spend is on activities that involve documents.¹¹³
- Of the total time spent on activities involving documents, about 20 percent is spent *creating* documents.¹¹⁴

We use these estimates for the occupations *other than IT and documents/content producers* to calculate that 10 percent (1/2 time on document activities * 20 percent of time on document activities creating documents) of annual work hours net of holidays and leave or a total of 176 per year are spent creating electronic documents or content.

We assume that *IT and content producers* spend twice as much time as non-IT/document/content producers annually on these activities (i.e., 20 percent of annual work hours net of holidays and leave).

We were also able to obtain some additional data on the costs of document preparation and making documents Section 508 compliant.

¹¹³ See Table 1 in IDC, [“The Knowledge Quotient: Unlocking the Hidden Value of Information Using Search and Content Analytics,”](#) June 2014. The corresponding tasks of consolidating and analyzing information, searching/gathering information, publishing information, and approving/signing documents that others send are considered to be activities that involve documents for purposes of this analysis.

¹¹⁴ IDC, [“Bridging the Information Worker Productivity Gap: New Challenges and Opportunities for IT,”](#) September 2012.



- One article estimates average cost for government writing charged by contract writers/editors at \$0.63 per word.¹¹⁵ This is equivalent to \$157.50 a page, assuming an average of 250 words per page.¹¹⁶
- There are a variety of estimates for how much it costs to make standard documents accessible. A 2016 Computer Human Interaction (CHI) presentation included the following estimates:¹¹⁷
 - An average cost of \$3 per page for basic accessibility (i.e., defined as adding no alternative text, only simple tags, calculated as \$30 for a 10-page CHI paper), with a subsidized rate of \$23 per article available.
 - In contrast, quoted commercial rates per article vary from \$85 to \$175, although volume discounts would be expected to reduce per-article costs.

To estimate the percentage of total available work time (i.e., 1,760 annual work hours net of holidays and leave) *spent doing basic document Section 508 compliance*, we assume that the cost of conducting basic document compliance is wholly composed of labor effort (no non-labor inputs) and consequently use the ratio of the per-page cost of direct accessibility to the per-page cost of government writing, which is approximately 2 percent of available work time (i.e., 2 percent = \$3 per page cost of direct accessibility / \$157.50 per page cost for government writing estimate).

For occupations other than IT and documents/content producers who would do basic Section 508 compliance, we estimate that these workers would spend 0.2 percent (10 percent of annual work hours creating electronic documents * 2 percent of available work time spent doing basic document compliance) of their time on Section 508 compliance for newly created documents.

IT and document/content producers are estimated to spend 2 percent of their time on Section 508 compliance for newly created documents, assuming that they will exert around five times the effort on document compliance than other occupations¹¹⁸ (2 percent of time on Section 508 compliance = 20 percent of annual work hours creating electronic documents * 2 percent of available work time spent doing basic document compliance * 5 times effort on document compliance compared to other occupations).

Direct costs per hour for these two categories of workers are estimated from the wages of the respective professions (i.e., Federal IT/document/content employees and contracting/other employees) as shown in Section 7.1.2. A multiplier of 1.54 to account for fringe benefits is added to each category's direct costs to arrive at a loaded cost per hour for the two categories of workers.

Table 17 outlines baseline Section 508 compliance costs for newly created documents.

¹¹⁵ Lynn Wasnak, "[Beyond the Basics: How Much Should I Charge?](#)" *Writer's Market*, 2006.

¹¹⁶ Word Counter Blog, "[How Many Pages Is 2000 Words?](#)" last viewed June 15, 2016.

¹¹⁷ Bigham et al., "[An Uninteresting Tour Through Why Our Research Papers Aren't Accessible.](#)" 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems, May 2016.

¹¹⁸ Rates charged for full Section 508 compliance are around five times higher than the rates charged for basic Section 508 compliance.



Table 17. Annual Baseline Cost of Section 508-Compliant Content Creation

Estimate Component	Value
Number of Federal IT/document/content employees	88,072
Average work hours per year	1,760
Percent of time spent on content creation	2%
Hours spent on content creation	3,100,134
Direct cost per hour	\$46.57
Multiplier to account for benefits	1.54
Loaded cost per hour	\$71.72
Subtotal for IT/document/content employees	\$222,326,674
Number of contracting and other Federal employees	110,419
Average work hours per year	1,760
Percent of time spent on content creation	0.2%
Hours spent on content creation	388,675
Direct cost per hour	\$42.37
Multiplier to account for benefits	1.54
Loaded cost per hour	\$65.25
Subtotal for contracting/other employees	\$25,361,585
Total baseline document compliance content creation cost	\$247,688,259

The baseline costs for ensuring the accessibility of electronic documents prepared by IT and other Federal employees are estimated at \$247.7 million annually.

7.1.6. 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 18.

Table 18. Annual Baseline Federal Agency Compliance Costs for In-House ICT (Millions)

Cost Component	Annual Cost
Policy development and implementation (from Table 13)	\$115.2
Employee training (from Table 14)	\$39.7
Software, Web, and audiovisual development (from Table 15)	\$188.5
Software, Web sites, and audiovisual media evaluation (from Table 16)	\$47.1
Electronic document creation (from Table 17)	\$247.7
Baseline agency compliance costs for in-house ICT	\$638.2

Overall, we estimate that Federal agencies incur costs of approximately \$638.2 million 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 procurement of compliant ICT products, services, and content from Federal contractors and vendors. The costs associated with purchasing compliant ICT are estimated in Section 7.2.



7.2. 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.¹¹⁹ 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 this 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.

7.2.1. 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 \$88 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 2012.¹²⁰ 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.

¹¹⁹ 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 will it be under Section E202.3.

¹²⁰ 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,



In the absence of more precise estimates of the Federal ICT budget, we have used a consensus estimate of \$104 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.

7.2.2. 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 2015 FPDS-NG records for purchases in all potentially applicable NAICS sectors were reviewed, edited, and tabulated. Econometrica tabulations of the FPDS-NG data for 2015 are presented in Table D-2 in Appendix D.¹²¹

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 revised Section 508 standards. If telecommunications and multimedia production services are included in the estimates of Federal IT spending, 2015 purchases of ICT products and services were \$51.2 billion. If these services are excluded, 2015 purchases of ICT products and services totaled approximately \$41.7 billion. The average of these two estimates is \$46.5 billion.

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

The high and low estimates of total Federal ICT spending (\$120 and \$88.7 billion) and Federal ICT purchases (\$51.2 and \$41.7 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.

Estimates of the share of Federal ICT procured from contractors and vendors are presented in Table 19.

Table 19. Estimates of Federal ICT Purchase Share, 2012

Calculation Element	OMB	Deltek
Federal ICT spending (millions)	\$88.71	\$120.00

and estimates on IT spending within the U.S. intelligence community.” Quoted in Information Week, “[Federal IT Spending Likely to Decline](#),” June 20, 2012.

¹²¹ 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.



Calculation Element	OMB	Deltek
High estimate of Federal ICT purchases (millions)	\$51.23	\$51.23
Low estimate of Federal ICT purchases (millions)	\$41.67	\$41.67
High estimate of Federal ICT purchase share	58%	43%
Low estimate of Federal ICT purchase share	47%	35%

The average of the four estimates of Federal ICT purchase share shown in Table 19 (46 percent) was used as a baseline estimate of the share of all Federal ICT that is procured from contractors and vendors.

7.2.4. 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 0.836, estimated from the shares of total ICT spending estimated from the data in Table 19. Procured ICT accounts for 46 percent of total ICT spending, while in-house ICT accounts for 54 percent of total ICT spending.
- Applying the 0.836 ratio to baseline agency compliance costs for in-house ICT (\$860.5 million from Table 18) yields an estimate of baseline compliance costs for procured ICT.

The calculation of baseline compliance costs for procured ICT is presented in Table 20.

Table 20. Annual Baseline Compliance Cost Estimate for Procured ICT

Calculation Element	Value
Baseline compliance cost for in-house ICT	\$638.21
Share of total spending on procured ICT	46%
Share of total spending on in-house ICT	54%
Ratio of procured to in-house ICT spending	0.836
Baseline compliance cost estimate for procured ICT (millions)	\$533.62

Baseline compliance costs for procured ICT were estimated at \$533.6 million in 2015, which include current costs to Federal Agencies to procure ICT products (e.g., hardware and software) and services.¹²²

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

¹²² This estimate serves as a baseline for which incremental procured ICT costs (including costs of compliant hardware) will be estimated in the incremental costs section of this FRIA.

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 will 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 will not be much greater than if the



Total baseline Section 508 compliance costs for agency-developed and procured ICT are estimated at about \$1.2 billion annually. This amount represents about 2 percent of annual Federal ICT spending, which is in the range between \$88 billion and \$120 billion, depending on what products and services are included in the total.

7.3. 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.

Census data indicate that there were 501 U.S. communications equipment manufacturers (NAICS code 334111, 334210, and 334220) with 105,868 employees in 2012.¹²⁴ 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.

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 will be unchanged, although the incidence of which parties bear the costs will be different.

¹²⁴ U.S. Census Bureau, 2012 SUSB Annual Datasets by Establishment Industry, "U.S., 6-digit NAICS, detailed employment sizes," [Statistics of U.S. Businesses](#). We have only included firms with more than 20 employees, as 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.

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 preamble and final rule. The PRA identifies four categories of 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 customers with disabilities 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 hourly wage of \$34.06 in May 2015.¹²⁶
- Fringe benefits represented 30 percent of total compensation in the communications equipment manufacturing sector in 2012.¹²⁷
- The fully loaded wage rate of \$44.28/hour (\$34.06 times the benefit multiplier of 1.3) was used to value employee time.

¹²⁶ BLS, "[May 2015 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 EC073111, 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 \$106 million annually (= 2.4 million hours * \$34.06 * 1.3 benefit multiplier).

7.4. 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 \$1.3 billion annually (see Table 21).

Table 21. Annual Baseline Compliance Cost Estimates (Billions)

Monetized Cost Component	Value
Baseline compliance cost for in-house ICT	\$0.638
Baseline compliance cost for procured ICT	\$0.534
Baseline compliance costs to conform with Section 255 product documentation and user support guidelines	\$0.106
Total baseline compliance costs	\$1.278



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

8.1. Factors Affecting Federal Agency Section 508 Compliance Costs

There are several factors that will collectively lead to changes in Federal agency compliance costs in the next few years, even if the 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, 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 semiannual 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 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 revised 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 revised 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, “[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.



- o The trusted tester program now permits agencies to purchase ICT that has already been certified as Section 508 compliant by other agency evaluations.¹³²
- o 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 will still be substantial transition costs associated with switching to the revised 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.

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

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

Similarly, the international adoption of increasingly harmonized standards for document accessibility can be expected to increase the availability of software features and templates that could reduce the amount of time required for telecommunications equipment manufacturers to prepare accessible electronic documentation and Web support materials.

¹³² Access Board, "[Trusted Tester Program](#)," Section 508 Webinar, April 03, 2014.



9. Major New Requirements in the Final Rule

Many aspects of the revised Section 508 requirements are not likely to entail measurable increases in compliance costs.¹³³ In some areas, references to WCAG 2.0 will 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” will 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 revised standards may also make it easier for developers to identify and remediate noncompliant content and products.

However, some of the revised standards represent expansions of or additions to current Section 508 requirements. 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 revised standards or, alternatively, indicate that significant work will be required to achieve compliance.

It should be noted that the final rule includes a so-called “safe harbor” provision that exempts existing (i.e., “legacy”) ICT from having to modify or upgrade to conform to the Revised 508 Standards so long as such ICT complies with the existing 508 regulations and is not “altered” after the compliance date (which is one year after publication of the final rule). “Alterations” consist of changes that materially affect the accessibility or usability of the covered hardware, software, or content (i.e., changes that affect interoperability, the user interface, or access to information or data). Importantly, the safe harbor provision in the Revised 508 Standards operates on an element-by-element basis; that is, each portion or component of the existing ICT is examined independently to assess the applicability of the safe harbor exemption. For example, assume a federal agency is making changes to the footer portion of its existing website through a content management system (CMS) two years from now. The new footer would need to conform to new requirements in the Revised 508 Standards, including WCAG 2.0 SC 1.4.3 for low contrast, but other existing page content managed through the CMS would not to be upgraded or revised (so long as otherwise compliant with the existing 508 Standards).

¹³³ 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 will 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 will not be measurable increases in cost in these situations.



9.1. 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 will be revised to support the revised Section 508 standards.

However, additional resources for software development, coding, and evaluation will 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 time as developers become more familiar with the revised standards, but the revised standards will increase the number and specificity of software accessibility requirements that need to be addressed on a continuing basis.

In addition, software developers (both Federal and contractor employees) will require additional training, and government evaluation, testing, and acquisition protocols will need to be revised. We expect that most of the costs associated with these activities will be incurred on a one-time basis. These costs are estimated in Sections 10.1.2, 10.1.3, and 10.1.4.

9.2. 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 required APIs. It is not clear that this will increase software development or acquisition costs because accessible applications, platforms, and systems are readily available in the current marketplace.¹³⁴ APIs that address accessibility issues are a standard feature of the most popular operating systems (e.g., Microsoft Windows, Apple OS X and iOS) as well as the popular development tools (e.g., Microsoft Visual Studio, Apple Xcode, IBM Eclipse).

9.3. Area 3: Authoring Tools

Vendors who develop and market authoring tools will incur significant costs to design and implement the capabilities required by the revised 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

¹³⁴ See Adobe Accessibility and other examples: “[Accessing PDF Documents with Assistive Technology: A Screen Reader User’s Guide](http://developer.apple.com/library/content/documentation/UserExperience/Conceptual/iPhoneAccessibility/); <http://developer.apple.com/library/content/documentation/Accessibility/Conceptual/AccessibilityMacOSX/>; <http://msdn.microsoft.com/en-us/library/windows/desktop/ff486375>; <http://www.eclipse.org/articles/article.php?file=Article-Accessibility351/index.html>; <http://developer.android.com/guide/topics/ui/accessibility/apps.html>



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 revised. The revised requirements do not appear to extend past the boundaries of other existing or emerging standards and therefore may not result in identifiable incremental costs.¹³⁵

9.4. Area 4: Assistive Technology

The revised standards include a provision that will require software that functions as AT to use standard platform accessibility services. Our 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 legacy AT equipment and applications.¹³⁶ Consequently, no identifiable costs were estimated for Federal agencies to comply with this revised requirement.

9.5. 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.¹³⁷ These costs are estimated in Section 10.1.5.

9.6. Area 6: Color and Contrast Settings

The adoption of testable requirements will increase the time required to evaluate software, Web sites, and audiovisual media but also simplify the evaluation and reduce the need to make subjective judgments about compliance.¹³⁸ For example, the revised 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

¹³⁵ This does not imply that the authoring tools currently used by Federal agencies all comply with the updated 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.

¹³⁶ 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.

¹³⁷ 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 updated standards without incurring more time than is necessary to ensure that content meets the current standards.

¹³⁸ Several free color-checking tools, such as Firefox [Colorzilla](#), are available for Web developers and content creators.



developers will 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 revised requirements in this area were developed. Instead, the impact of these revised requirements is embedded in the overall cost estimates developed for software, Web, and multimedia development and evaluation (Sections 10.1.3 and 10.1.4) and electronic content (Sections 10.1.5).

9.7. Area 7: Audio Controls on Web Pages

Web developers and site administrators will have to evaluate current and newly developed audiovisual content and applications to ensure that they comply with the revised 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:¹³⁹

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 revised requirement were developed.

9.8. 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 revised standards in this area.

9.9. 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).¹⁴⁰ 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.

¹³⁹ HowTo.gov, “[Making Multimedia Section 508 Compliant and Accessible](#),” updated July 26, 2013.

¹⁴⁰ 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).



9.10. 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.¹⁴¹ 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.¹⁴²

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 22.

Table 22. Telecommunications Equipment Manufacturer Support Pages

Telecommunications Equipment Manufacturer Site*	Support Page Link on Home Page?	Support Page Errors**
Alcatel	Yes	22
Apple Inc.	Yes	5
Canon USA	Yes	27
Cisco Systems, Inc.	Yes	12
Ericsson, Inc.	No	N/A
Hewlett-Packard Company	Yes	16
HTC Corporation	Yes	16
Kyocera Wireless Corporation	Yes	36
LG Electronics MobileComm U.S.A., Inc.	Yes	2
Lucent	Yes	6
Microsoft Corporation	Yes	2
Mitel Networks, Inc.	No	N/A
Motorola Mobility	No	N/A
NEC Corporation of America	Yes	18
Nokia	Yes	5
Panasonic Corporation of North America	Yes	6
RadioShack Corporation	No	N/A
Research in Motion Limited/RIM	Yes	6
Samsung Telecommunications America	No	N/A
Sharp Electronics	Yes	21
Skype Communications Sarl	Yes	2

¹⁴¹ 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.

¹⁴² 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.



Telecommunications Equipment Manufacturer Site*	Support Page Link on Home Page?	Support Page Errors**
Sony Mobile Communications (USA), Inc.	Yes	6
Toshiba America Information Systems, Inc.	Yes	5
Uniden America Corporation	Menu***	1
VTech Telecommunications, Ltd.	Menu***	31

*Companies listed on FCC, "Section 255 Manufacturers," January 29, 2014.

**Identified using WebAIM.org WAVE checker, September 12, 2016.

***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 (11 of 20) 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. These pages generally appear to require relatively modest revisions to improve accessibility.

Another 9 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.



10. Incremental Cost Estimates of the Final Rule

Ideally, this regulatory evaluation would include estimates of the incremental costs associated with meeting each of the revised accessibility standards. However, the increase in compliance costs attributable to specific provisions depends on the extent of current compliance with the revised 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—whether measured against the current Section 508 standards or those in the final rule—within and among agencies, agency components, and types of ICT. In addition, the amount of effort and cost that will be incurred to ensure that some form of ICT complies with a specific provision in the revised standards depends on the extent to which it already complies with other provisions in the revised requirements. Consequently, it is not possible to develop estimates of the potential increases in costs from separately implementing each of the individual provisions included in the final rule.

This section estimates the incremental compliance costs for complying with this final rule to Federal Agencies and other covered parties complying with the current Section 508 standards (but for which are not already using the WCAG 2.0 standards) for the 16 new Success Criteria that have equivalent provisions in the ICT final rule. (Incremental costs for complying with this final rule to Agencies already complying with the WCAG 2.0 standards in their entirety are effectively zero.)

The approach used to estimate incremental compliance costs in this analysis was to evaluate the potential impact of the revised requirements (particularly those discussed in Section 9) 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 and procured ICT.

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

10.1. Federal Agency Incremental Costs for In-House ICT

10.1.1. Section 508 Policy Development and Implementation

The final rule will 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 will need to review and revise all existing policy directives and guidance for agency employees.
- These revised materials will 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 will also need to be revised.

For this analysis, we have assumed that agencies will incur a one-time cost to support the transition to the revised Section 508 standards. Since we do not know the exact value of this one-time cost, we assume that its value could be as much as 100 percent or as little as 25 percent of the current cost for policy development and implementation activities. An expected value of 50 percent was used to develop an estimate of the projected one-time impact of the final rule on policy development and implementation costs, and 25 percent and 100 percent were used as sensitivity analysis values.

Recurring annual costs will likely increase by a small percentage as well, because the revised standards and guidelines are more extensive and specific than the current Section 508 standards. However, Section 508 offices and coordinators will be able to draw on an expanded set of interagency and external resources to support their activities because the revised standards will 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 will not ultimately be higher than they would have been under the current standards. However, we assumed that recurring annual costs for policy development and implementation will increase by an average of 5 percent in this analysis, and sensitivity analysis values used include 0 percent and 10 percent.

An estimate of the impact of the revised Section 508 standards on this component of incremental compliance costs for Federal agencies is presented in Table 23.

Table 23. Projected 10-Year Cost Increase for Policy Development and Implementation

Estimate Component	High Cost Scenario	Expected Scenario	Low Cost Scenario
Baseline costs (millions)	\$115.2	\$115.2	\$115.2
Projected increase (initial)	100%	50%	25%
Initial cost increase (millions)	\$115.2	\$57.6	\$28.8
Projected increase (recurring)	10%	5%	0%
Recurring cost increase (millions)	\$11.5	\$5.8	\$0.0
Present value of policy development and implementation costs, 2018-2027, 7% discount rate (millions)*	\$126.2	\$62.9	\$18.5

*Present value of 2018–2027 costs calculated using a discount rate of 7 percent.

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 (sensitivity analysis range of \$28.8 million to \$115.2 million) would be spread over a 3-year period, with recurring costs of \$5.8 million (sensitivity analysis range of \$0.0 million to \$11.5 million) incurred annually during each of the remaining 7 years in the 10-year analysis period.



10.1.2. Training of Federal Employees

This section estimates the incremental costs for training current Federal employees with Section 508 responsibilities and additional Federal employees that will acquire Section 508 compliance responsibilities as a result of this rule, and summarizes the total incremental costs of this training.

10.1.2.1. Training of Current Federal Employees

The final rule will 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 will be likely to incur a substantial one-time increase in training costs associated with adoption of revised standards:

- Software developers will 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 9.1). They will also need information on the revised requirements for support of accessibility services and authoring tools (see the discussion in Sections 9.2 and 9.3).
- Web and other content developers will need to be informed about the more detailed requirements in the final rule relating to issues such as color contrast, text resizing, audio controls, and captioning (see the discussion in Sections 9.6 through 9.8).
- Employees evaluating in-house ICT will need to understand the more specific and extensive benchmarks that must be satisfied to ensure that procured or developed ICT complies with the revised standards.

For this analysis, we have assumed that agencies will incur one-time training costs in an amount equal to the current annual baseline cost for current Federal employee training, with sensitivity analysis values of 50 percent and 200 percent of current annual baseline costs for current Federal employee training.¹⁴³ (This one-time cost is incurred in addition to the baseline training costs, though only the one-time cost is specifically attributable to this rule.) Recurring (annual) costs will also be likely to increase by a small percentage because the revised standards and guidelines are more extensive and specific than the current Section 508 standards. We have assumed that this recurring increase in policy development and implementation costs will average about 10 percent after the first year, with sensitivity analysis values of 5 percent and 20 percent.

An estimate of the cost of the revised Section 508 standards attributed to training current Federal employees is presented in Table 24.

Table 24. Projected 10-Year Cost Increase for Current Federal Employee Training

Estimate Component	High Cost Scenario	Expected Scenario	Low Cost Scenario
Current employees' training costs (millions)	\$39.7	\$39.74	\$39.7
Projected increase (one time only)	200%	100%	50%
Initial training cost increase (millions)	\$79.5	\$39.74	\$19.9
Projected increase (recurring training)	20%	10%	5%

¹⁴³ 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.



Estimate Component	High Cost Scenario	Expected Scenario	Low Cost Scenario
Recurring training cost increase (millions)	\$7.95	\$3.97	\$1.99

Federal agencies currently have very restricted budgets for training. This analysis assumes that the initial cost increase of \$39.7 million (sensitivity analysis range of \$19.9 million to \$79.5 million) would be spread over a 3-year period, with recurring costs of \$3.97 million (sensitivity analysis range of \$1.99 million to \$7.95 million) incurred annually during each of the remaining 7 years in the 10-year analysis period.

10.1.2.2. Training of Additional Federal Employees

Commenters to the PRIA suggested that additional Federal employees (beyond those noted above) would have to undertake Section 508 compliance responsibilities as a result of this rule. Moreover, the final rule requires compliance for all public-facing agency official communications as well as nine categories of non-public-facing agency official communications: (1) Emergency notifications, (2) initial or final decisions adjudicating administrative claims or proceedings, (3) internal or external program or policy announcements, (4) notices of benefits, program eligibility, employment opportunities or personnel actions, (5) formal acknowledgements or receipts, (6) questionnaires or surveys, (7) templates or forms, and (8) educational or training materials or (9) Intranet content designed as a Web page.¹⁴⁴

An estimate of the number of these additional Federal employees was derived by determining (via analyst judgment) which Federal occupations in the December 2015 [OPM FedScope Employment Data “Cube”](#) involved document work pertaining to the electronic documents and other electronic content addressed in the final rule.

Occupations employing more than 1,000 Federal workers were then flagged as either involving document work or not involving document work. This resulted in a total of 1,171,653 additional Federal employees with document work tasks. These occupations map to five occupational categories (Professional, Administrative, Technical, Clerical, and Other White Collar).¹⁴⁵ The Professional group includes occupations such as pharmacist and economist; the Administrative group includes occupations such as human resources management and administrative officer; the Technical group includes occupations such as contact representative and compliance inspection and support; the Clerical group includes occupations such as secretary and legal assistant; and the Other White Collar group includes emergency management specialists.

However, not all of these 1,171,653 Federal information workers would necessarily be involved with making documents and other content Section 508 compliant. Therefore, we created the following method for determining the fraction of this total number of workers that would have such responsibilities.

We applied a percentage estimate to all of the flagged document workers in each of the occupational categories. The percentage estimate for each occupation group with potential Section 508 obligations was determined using the following assumptions:

¹⁴⁴ National Archives and Records Administration, “Part III: Architectural and Transportation Barriers Compliance Board”, Federal Register, Vol. 80, No. 39, pg. 10894, February 27, 2015.

¹⁴⁵ Specific definitions of these categories can be found in OPM’s [2006 Federal Employment Report](#).



- 18 percent of Administrative Occupation Employees: *All supervisors of Administrative employees* would have Section 508 responsibilities.
- 100 percent of Clerical Occupation Employees: *All clerical employees* have Section 508 obligations, since the rule also requires non-public documents such as acknowledgements and receipts.
- 76 percent of Professional Occupation Employees: *Professional employees in GS-11 level or equivalent and above* would have Section 508 responsibilities for both public-facing and non-public-facing communications.
- 16 percent of Other White Collar Occupation Employees: *All supervisors of Other White Collar employees* have Section 508 obligations, since emergency management specialists deal with documents such as emergency notifications.
- 6 percent of Technical Occupation Employees: *All supervisors of Technical employees* would review final products to ensure Section 508 compliance.¹⁴⁶

Using these assumptions, the total number of additional employees with Section 508 obligations due to the final rule is estimated to be 447,642 (see Table 25).

Table 25. Additional Federal Workers With Section 508 Compliance Responsibilities

Occupation Category	Federal Employees in Document Work	Estimated Percentage of Federal Employees in Document Work With Section 508 Responsibilities	Federal Employees in Document Work With Section 508 Responsibilities
Administrative	560,919	18%	100,965
Clerical	58,543	100%	58,543
Professional	363,706	76%	276,417
Other White Collar	4,082	16%	653
Technical	184,403	6%	11,064
TOTAL	1,171,653		447,642

Source: Econometrica review of data in December 2015 [OPM FedScope Employment Data "Cube."](#)

To estimate the cost of training these additional employees, we assumed that the direct expense of their training (e.g., training module costs) was zero. The material component of training cost is thus the opportunity cost of time that these workers spend in training that could otherwise be spent elsewhere on job responsibilities. The best estimate of this time is the loaded hourly wage rate multiplied by the estimated number of hours spent in such training. An estimate of 1.37 hours is

¹⁴⁶ These percentages were estimated using all Federal employees in these categories, not only those Federal employees flagged as engaging in document work.



assumed by averaging the length of non-IT training courses¹⁴⁷ provided on www.section508.gov.¹⁴⁸

We estimate that the cost of training additional Federal employees undertaking Section 508 compliance as a result of this rule to be composed of a \$41.8 million (sensitivity analysis range: \$20.9 million to \$83.5 million) one-time projected increase in additional training costs (equal to 100 percent (sensitivity analysis range: 50 percent to 200 percent) of the additional employees’ training cost) plus a recurring annual training cost increase of \$4.2 million (sensitivity analysis range: \$2.1 million to \$8.4 million) (equal to 10 percent (sensitivity analysis range: 5 percent to 20 percent) of the additional training cost).

Table 26 shows our calculations and estimates of this additional cost.

Table 26. 10-Year Cost of Training Additional Employees With Section 508 Responsibilities

Estimate Component	High Cost Scenario	Expected Scenario	Low Cost Scenario
Additional employees with possible new Section 508 responsibilities			
Administrative	100,965	100,965	100,965
Clerical	276,417	276,417	276,417
Professional	11,064	11,064	11,064
Other White Collar	58,543	58,543	58,543
Technical	653	653	653
Total number of employees needing training	447,642	447,642	447,642
Direct expense per employee	\$0	\$0	\$0
Direct expense of training (1)	\$0	\$0	\$0
Average hourly wage			
Administrative	\$43.33	\$43.33	\$43.33
Clerical	\$50.85	\$50.85	\$50.85
Professional	\$23.82	\$23.82	\$23.82
Other White Collar	\$18.50	\$18.50	\$18.50
Technical	\$28.77	\$28.77	\$28.77
Value of trainee time			
Administrative (1.37 hour each)	\$5,993,610	\$5,993,610	\$5,993,610
Clerical (1.37 hour each)	\$19,255,289	\$19,255,289	\$19,255,289
Professional (1.37 hour each)	\$361,068	\$361,068	\$361,068
Other White Collar (1.37 hour each)	\$1,483,742	\$1,483,742	\$1,483,742
Technical (1.37 hour each)	\$25,739	\$25,739	\$25,739
Indirect cost of trainee time	\$27,119,448	\$27,119,448	\$27,119,448

¹⁴⁷ The training courses titled “Accessible Conferences,” “Buying Accessible E&IT,” “Section 508 Coordinators,” “Additional Accessibility & Usability Concerns,” “Buying Accessible Computers,” “Micro-Purchases and Section 508,” and “Buying Accessible Telecommunications Products” were averaged in particular.

¹⁴⁸ GSA Section 508, “[508 Training Courses](#),” accessed on August 24, 2016.



Estimate Component	High Cost Scenario	Expected Scenario	Low Cost Scenario
Multiplier to account for benefits	1.54	1.54	1.54
Loaded cost of additional trainee time (2)	\$41,763,950	\$41,763,950	\$41,763,950
Additional employees training cost (1) + (2)	\$41,763,950	\$41,763,950	\$41,763,950
Projected increase (one time only)	200%	100%	50%
Initial training cost increase (millions)	\$83,527,900	\$41,763,950	\$20,881,975
Projected increase (recurring)	20%	10%	5%
Recurring training cost increase	\$8,352,790	\$4,176,395	\$2,088,198

10.1.2.3. Total Incremental Training Costs for Federal Employees With Section 508 Compliance Responsibilities

Table 27 shows the total initial (one-time) training cost increase and recurring training annual cost increase as a result of the additional duties for Federal employees with Section 508 compliance responsibilities.

Table 27. Total 10-Year Cost Increases for Federal Employee Training

Estimate Component	High Cost Scenario	Expected Scenario	Low Cost Scenario
Current employees' training costs (millions)	\$39.7	\$39.7	\$39.7
Training costs for additional employees (millions)	\$41.8	\$41.7	\$41.8
Total training costs	\$81.5	\$81.5	\$81.5
Projected increase (one time only)	200%	100%	50%
Initial training cost increase (millions)	\$163.0	\$81.5	\$40.8
Projected increase (recurring training)	20%	10%	5%
Recurring training cost increase (millions)	\$16.3	\$8.2	\$4.1
Present value of Federal employee training costs, 2018-2027, 7% discount rate (millions)*	\$180.4	\$89.1	\$44.2

*Present value of 2018–2027 costs calculated using a discount rate of 7 percent.

Total projected cost increases for Federal employees' training are estimated at initially \$81.5 million (sensitivity analysis range: \$40.8 million to \$163.0 million) spread over 3 years, and \$8.2 million (sensitivity analysis range: \$4.1 million to \$16.3 million) annually recurring for each of the remaining 7 years of the analysis period.

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

Software and Web developers will require additional time to ensure that the platforms and applications they create and modify comply with the revised application of WCAG 2.0 standards to software.¹⁴⁹

¹⁴⁹ See discussion in Sections 4.4.1 and 8.1.



- Design time will be required to ensure that software complies with the Section 502 requirements for interoperability with AT accessibility services (see Section 9.2).
- Developers of authoring tools will need additional time to ensure that this software complies with the Section 504 requirements (see Section 9.3).
- Developers of software that functions as AT will need additional time to ensure that these applications comply with the Section 503 requirements for AT (see Section 9.4).
- Multimedia developers will need to spend time to comply with the requirements for captioning and user controls (see Sections 9.7 and 9.8).
- Additional time will be required for these employees to develop compliant program documentation and support materials.

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

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

For this analysis, we have assumed that it will initially take developers of software, Web, and multimedia ICT 20 percent longer (sensitivity analysis values of 10 percent longer and 40 percent longer) to develop compliant platforms, applications, and content than is currently required, but only half as long to do so (i.e., 10 percent longer) (sensitivity analysis values of 5 percent longer and 20 percent longer) after the initial phase-in period.

An estimate of the impact of the revised Section 508 standards on incremental ICT development costs for Federal agencies is presented in Table 28.

Table 28. Projected 10-Year Cost Increase for Software/Web/Multimedia Development Compliance

Estimate Component	Software Development	Web Development	Audiovisual Production	High Cost Scenario All Applications	Expected Scenario All Applications	Low Cost Scenario All Applications
Baseline costs (millions)	\$166.9	\$15.4	\$6.2	\$188.5	\$188.5	\$188.5
Projected increase (initial)	20%	20%	20%	40%	20%	10%
Initial cost increase (millions)	\$33.4	\$3.1	\$1.2	\$75.4	\$37.7	\$18.8



Estimate Component	Software Development	Web Development	Audiovisual Production	High Cost Scenario All Applications	Expected Scenario All Applications	Low Cost Scenario All Applications
Projected increase (recurring)	10%	10%	10%	20%	10%	5%
Recurring increase (millions)	\$16.7	\$1.5	\$0.6	\$37.7	\$18.8	\$9.4
Present value of software/web/multimedia development costs, 2018-2027, 7% discount rate (millions)*				\$219.5	\$109.4	\$55.0

*Present value of 2018–2027 costs calculated using a discount rate of 7 percent.

Software development typically takes place over an extended period of time. This analysis assumes that the initial cost increase of \$37.7 million (sensitivity analysis range of \$18.8 million to \$75.4 million) would be spread over a 3-year implementation period, with recurring costs of \$18.8 million (sensitivity analysis range of \$9.4 million to \$37.7 million) incurred annually during each of the remaining 7 years in the 10-year analysis period.

10.1.4. 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 revised approach for software and Web sites means that more evaluation time will be required in the design, implementation, and testing stages for these products. This analysis assumes that the final rule would initially require a 20-percent increase in evaluation and testing time, using sensitivity analysis estimates of 10 percent and 40 percent increases.¹⁵⁰ This 20-percent value was estimated in the PRIA.

It is possible that the amount of time required for evaluation and testing will decline after an initial adjustment period. We assume that opportunities for additional cost savings from interagency evaluation and testing will arise as staff becomes more familiar with testing and evaluation under the revised standards, relative to the current standards after an initial increase in evaluation time. Consequently, this analysis assumes that a small incremental increase in evaluation and testing effort (20 percent over current baseline hours, the same Expected of recurring costs estimated in the PRIA, with sensitivity analysis values of 10 percent and 40 percent over current baseline hours) will be incurred on a continuing basis.

¹⁵⁰ This is an estimate of the time that will be required to evaluate compliance with the full set of updated standards. Different provisions in the updated standards will be applicable for varying types of software, Web sites, and audiovisual media. The addition or deletion of single provisions from the updated requirements will not be likely to materially affect the total time required.



The estimated impact of the revised Section 508 standards on incremental compliance evaluation and testing costs for Federal agencies is presented in Table 29.

Table 29. Projected 10-Year Cost Increase for Software/Web/Audiovisual Media Evaluation

Estimate Component	Software Evaluation	Web Evaluation	Audiovisual Evaluation	High Cost Scenario All Applications	Expected Scenario All Applications	Low Cost Scenario All Applications
Baseline costs (millions)	\$41.7	\$3.8	\$1.6	\$47.1	\$47.1	\$47.1
Projected increase (initial)	20%	20%	20%	40%	20%	10%
Initial cost increase (millions)	\$8.3	\$0.8	\$0.3	\$18.8	\$9.4	\$4.7
Projected increase (recurring)	20%	20%	20%	40%	20%	10%
Recurring increase (millions)	\$8.3	\$0.8	\$0.3	\$18.8	\$9.4	\$4.7
Present value of software/web/multimedia evaluation costs, 2018-2027, 7% discount rate (millions)*				\$97.6	\$48.7	\$24.5

*Present value of 2018–2027 costs calculated using a discount rate of 7 percent.

The analysis estimates that the Federal Government will incur initial increased costs of \$9.4 million (sensitivity analysis range of \$4.7 million to \$18.8 million) spread over a 3-year implementation period and \$9.4 million (sensitivity analysis range of \$4.7 million to \$18.8 million) for the remaining 7 years of the 10-year analysis period to evaluate and test agency-developed ICT.

10.1.5. Creation of Documents and other Electronic Content

It is not clear that complying with the revised standards and guidelines for electronic content will 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 revised 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 compliant under the revised standards because current authoring tools and templates may provide lower or less consistent support for incorporating accessibility.

Based on these considerations, this analysis assumes that creators and editors of electronic content will initially require 10 percent more time on average to ensure that covered materials comply with the revised standards, with sensitivity analysis estimates of 5 percent and 20 percent more time.¹⁵¹ As Section 508-compliant authoring tools and templates become more widely available and

¹⁵¹ Different provisions will be applicable for varying types of electronic documents and other electronic content. The addition or deletion of single requirements will not materially affect the total time required.



employee training is completed, it is reasonable to assume that the additional time required to create electronic content will be less in future years. This analysis assumes that the incremental time required after a 3-year phase-in period will be 5 percent, with sensitivity analysis values of 0 percent and 10 percent, after the revised 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 accessible electronic documents under the revised Section 508 standards will be the same as those employees needed under the current standards (See Table D-3).

The estimated impact of the revised Section 508 standards on electronic document creation costs for current Federal agencies’ employees is presented in Table 30 and is approximately \$24.8 million in the first 3 years (sensitivity analysis range of \$12.4 million to \$49.5 million) and has a recurring annual cost of \$12.4 million (sensitivity analysis range of \$0 to \$24.8 million) afterwards.

Table 30. Projected 10-Year Cost Increase for Section 508-Compliant Document Creation for Federal Employees With Current Compliance Responsibilities

Estimate Component	High Cost Scenario	Expected Scenario	Low Cost Scenario
Baseline costs (millions) (from Table 17)	\$247.7	\$247.7	\$247.7
Projected increase (initial)	20%	10%	5%
Initial cost increase (millions)	\$49.5	\$24.8	\$12.4
Projected increase (recurring)	10%	5%	0%
Recurring cost increase (millions)	\$24.8	\$12.4	\$0.0

Additionally, the revised Section 508 standards will impose cost for electronic document creation on the additional 447,642 Federal employees who would have Section 508 compliance responsibilities (e.g., Administrative, Professional, etc.) as identified in Section 10.1.2.2. The time spent on Section 508 compliance is estimated at 0.1 percent in these calculations rather than the 0.2 percent of time estimate spent on Section 508 compliance from Section 7.1.5 for occupations other than IT and document/content producers. This is because the additional Federal employees are in more analytically intensive occupations, requiring a higher usage of spreadsheet software as opposed to word processing software. A study examining daily employee usage of Microsoft Office found that employees spent more time using Microsoft Excel (8 minutes) than using Microsoft Word (5 minutes).¹⁵² Given that a high number of the additional employees are in occupations that would use Microsoft Excel for analytical purposes and that most of these spreadsheets would not need to be made accessible, we assume that the additional Federal employees spend 0.1 percent of their time on Section 508 compliance. We applied our hourly estimates to the loaded hourly wage estimates for these occupations as calculated in Section 10.1.2.2.

¹⁵² <http://www.techworld.com/news/security/microsoft-office-applications-barely-used-by-many-employees-new-study-shows-3514565/>.



Table 31. Projected Document Creation Costs Increase for Additional Employees With Section 508 Compliance Responsibilities

Estimate Component	Value
Number of additional federal employees	447,642
Average work hours per year	1,760
Percent of time spent on document creation	0.1%
Hours spent on document creation	787,850
Direct cost per hour	\$44.22
Multiplier to account for benefits	1.54
Loaded cost per hour	\$68.10
Total document creation cost (initial and recurring) for additional employees	\$53,652,958

The estimates for initial and recurring document creation cost increases for employees with current compliance responsibilities and the estimate for additional employees with compliance responsibilities are shown in Table 32.

Table 32. Total 10-Year Document Creation Cost Increases

Estimate Component	High Cost Scenario	Expected Scenario	Low Cost Scenario
Initial cost increase for current employees (millions)	\$49.5	\$24.8	\$12.4
Initial cost increase for additional employees (millions)	\$53.7	\$53.7	\$53.7
Total initial cost increase (millions)	\$103.2	\$78.4	\$66.0
Recurring cost increase for current employees (millions)	\$24.8	\$12.4	\$0.0
Recurring cost increase for additional employees (millions)	\$53.7	\$53.7	\$53.7
Total recurring cost increase (millions)	\$78.4	\$66.0	\$53.7
Present value of document creation costs, 2018-2027, 7% discount rate (millions)*	\$422.2	\$349.1	\$286.5

*Present value of 2018–2027 costs calculated using a discount rate of 7 percent.

This analysis estimates that the Federal Government will incur increased costs of \$78.4 million (sensitivity analysis range of \$66.0 million to \$103.2 million) over the first 3 years of the 10-year analysis period to create electronic documents. The recurring cost is estimated to be \$66.0 million (sensitivity analysis range of \$53.7 million to \$78.4 million) annually in each of the remaining 7 years in the analysis period.

10.1.6. 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 final rule on Federal agency compliance costs. The discussion provided in Sections 10.1.1 through 10.1.5 makes clear that the extent of this uncertainty can be potentially reduced by assessing the potential impact of the final 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 estimates of incremental compliance costs in this regulatory evaluation.



Table 33 presents the percentage increases for each cost component used to develop the estimates of incremental compliance costs incurred by Federal agencies occurring because of the final rule.

Table 33. Estimates of the Percentage Increases in Agency Compliance Costs for In-House ICT

Cost Component	One-Time Costs			Recurring Annual Costs		
	High Cost Scenario	Expected Scenario*	Low Cost Scenario	High Cost Scenario	Expected Scenario*	Low Cost Scenario
Policy development and implementation	100%	50%	25%	10%	5%	1%
Employee training	200%	100%	50%	20%	10%	5%
Software, Web, and audiovisual development	40%	20%	10%	20%	10%	5%
Software, Web sites, and audiovisual media evaluation	40%	20%	10%	40%	20%	10%
Electronic document creation	20%	10%	5%	10%	5%	0%

*Estimate used in the compliance cost calculations.

In the absence of better data or more available information on the potential impact of the revised standards, estimates of the projected increases in one-time and recurring costs shown in Table 33 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 estimates of the overall increase in compliance costs for Federal agencies attributable to the revised standards and guidelines. Estimates of the impact of the revised Section 508 standards for overall compliance costs for Federal agencies are presented in Table 34.

Table 34. Projected Increase in Annual Agency Compliance Costs for In-House ICT (Millions of 2017 Dollars)

Cost Component	Initial Cost			Recurring Cost		
	High Cost Scenario	Expected Scenario*	Low Cost Scenario	High Cost Scenario	Expected Scenario*	Low Cost Scenario
Policy development/implementation	\$115.2	\$57.6	\$28.8	\$11.5	\$5.8	\$0.0
Employee training	\$163.0	\$81.5	\$40.8	\$16.3	\$8.2	\$4.1
Software/Web/audiovisual development	\$75.4	\$37.7	\$18.8	\$37.7	\$18.8	\$9.4
Software/Web/audiovisual evaluation/testing	\$18.8	\$9.4	\$4.7	\$18.8	\$9.4	\$4.7
Electronic document creation	\$103.2	\$78.4	\$66.0	\$78.4	\$66.0	\$53.7



Cost Component	Initial Cost			Recurring Cost		
	High Cost Scenario	Expected Scenario*	Low Cost Scenario	High Cost Scenario	Expected Scenario*	Low Cost Scenario
Overall increase in agency costs for in-house ICT	\$475.6	\$264.6	\$159.1	\$162.8	\$108.2	\$71.9
Percentage of annual baseline costs for in-house ICT	75%	41%	25%	26%	17%	11%

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

During the first 3 years after the revised standards and guidelines take effect, Federal agencies are projected to incur additional one-time costs to transition to the rulemaking’s Section 508 standards. These one-time costs are projected to be about \$264.6 million (sensitivity analysis range of \$159.1 million to \$475.6 million), or 41 percent (25 percent to 75 percent) of the annual baseline costs of \$638.2 million estimated for agencies to comply with the current Section 508 standards.

Based on our assumptions about the impact of specific areas included in the revised standards and guidelines on baseline compliance costs, the increase in recurring overall Federal agency compliance costs is projected to be approximately \$108.2 million (sensitivity analysis range of \$71.9 to \$162.8 million) annually. This represents an increase of about 17 percent (11 percent to 26 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 incremental costs were calculated over a 10-year analysis period (assumed to be from 2018 through 2027) and converted into base-year (2017) present values using 7-percent and 3-percent discount rates. A summary of these estimates is provided in Table 35.¹⁵³

Table 35. Present Value in 2017 of Monetized 2018–2027 Incremental Costs for In-House ICT (Millions of 2017 Dollars)

Monetized Cost Component	7-Percent Discount Rate			3-Percent Discount Rate		
	High Cost Scenario	Expected Scenario	Low Cost Scenario	High Cost Scenario	Expected Scenario	Low Cost Scenario
Policy development/implementation	\$127.4	\$62.9	\$18.3	\$161.0	\$80.1	\$23.4
Employee training	\$180.4	\$89.1	\$44.2	\$227.9	\$113.3	\$56.5
Software/Web/audiovisual media development	\$221.6	\$109.4	\$54.4	\$280.0	\$139.3	\$69.4
Software/Web/audiovisual media evaluation/testing	\$98.6	\$48.7	\$24.2	\$124.6	\$62.0	\$30.9

¹⁵³ A table showing the estimated costs in each year of the 10-year analysis period is provided in Appendix E.



Monetized Cost Component	7-Percent Discount Rate			3-Percent Discount Rate		
	High Cost Scenario	Expected Scenario	Low Cost Scenario	High Cost Scenario	Expected Scenario	Low Cost Scenario
Electronic document and other content creation	\$426.3	\$349.1	\$283.2	\$538.6	\$444.2	\$361.8
Total 2018–2027 costs for in-house ICT	\$1,054.2	\$659.2	\$424.3	\$1,332.1	\$838.9	\$542.1

The present value of monetized incremental costs expected to result from implementation of the final rule of the Section 508 standards during the 10-year analysis period is estimated at \$659.2 million (sensitivity analysis range of \$424.3 million to \$1.1 billion) using a 7-percent discount rate and \$838.9 million (sensitivity analysis range of \$542.1 million to \$1.3 billion) using a 3-percent discount rate.

The estimates in Table 35 and the analysis presented in this section indicate that Federal agencies will incur substantial costs to implement and comply with the revised 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 revised accessibility standards.

10.2. Estimated Cost Increases Associated With Procured ICT

With one exception below (for braille instruction costs), 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 will comply with the revised Section 508 standards from Federal contractors and vendors.

However, an estimate of incremental compliance costs associated with procured ICT (excepting braille instruction costs) can be developed as follows:

- The share of total Federal agency ICT procured from contractors and vendors is 46 percent (see Section 7.2.4).
- 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 approximately 0.836 (.46/.54). This ratio was applied to each of the cost estimates shown in Table 34 to obtain estimates of costs for the same category that are associated with procured ICT.

Estimates of costs to Federal Agencies to procure compliant ICT hardware (as well as other ICT products and services) are reflected in the total of the five cost categories outlined in Table 37 below.



Due to comments, incremental costs to agencies to add braille instructions on certain ICT are considered in the cost of the final rule. Cost from braille instructions on certain ICT such as copiers, printers, and scanners are derived from estimating the cost of a braille label, the cost of placing the braille label on the hardware, and the quantity of hardware impacted by this provision.¹⁵⁴

The cost of a braille label was estimated to be around \$2.50. This estimate was derived by taking an average of a sampling of braille label costs:

- A single-faced rescue window label sells for [\\$19.29](#) per pack of five labels, which works out to around \$4 per label.
- A warranty void label sells for [\\$5.39](#) per pack of 14 labels, which works out to around \$0.40 per label.
- Custom worded vinyl labels sell for [\\$9.89](#) per pack of 25 labels, which works out to around \$0.40 per label.
- Voltage warning labels sell for [\\$27.59](#) per pack of 5 labels, which works out to around \$5 per label.

The hardware necessary to be made accessible was estimated to be used by around four Federal employees each. Given that there are an estimated 2 million Federal employees,¹⁵⁵ this works out to around 500,000 pieces of hardware needed to be made accessible. The four employees per hardware estimate was derived using information from the following studies:

- “With 135,000 employees in 80 countries, P&G prints and copies millions of documents annually. In early 2008, those documents came from 45,000 individual devices—copiers, printers, scanners and fax machines—that were shared by just four employees each, on average.” (Source: <http://www.computerworld.com/article/2550560/computer-hardware/taming-the-printer-chaos.html>.)
- “The answer is surprisingly low but then that is probably because the print volume analysed was high. Studies say that the answer to how many printers per user is 4.4. This means that for every 4.4 users, you’re going to need one printer machine. Needless to say, this is a highly standardised and generalised rule that, in all likelihood, doesn’t even apply to your business setup.” (Source: <http://blog.inkjetwholesale.com.au/buying-guide/how-many-printers-per-user-do-you-need-in-your-office/>.)

Using a label installation time estimate of 6 minutes (or 0.1 hours) for a worker in standard occupation classification (SOC) 49-2094 “Electrical and Electronics Repairers, Commercial and Industrial Equipment,” the cost of installation per label is computed to be \$3.54 (\$35.43 cost per hour * 0.1 hours).¹⁵⁶ Thereby, total costs per installed label are estimated to be \$6.04 (\$3.54 + \$2.50).

¹⁵⁴ This does not account for real estate cost (finding a place to put the label).

¹⁵⁵ Based on the total number of employees in the 2015 Federal Employment Data Cube.

¹⁵⁶ The mean hourly wage for the occupation is [\\$27.25](#), which works out to an hourly cost of \$35.43, using a 1.3 overhead factor.



We assume that, given an average 5-year lifecycle of impacted hardware,¹⁵⁷ one-fifth of all impacted hardware will be replaced annually and therefore replacement hardware will be labeled appropriately. Applying the \$6.04 per installed label value to the 100,000 machines needing labels per year, the braille provision will result in annual costs of \$604,250 (\$250,000 in braille labels per year + \$354,250 installation time costs per year).

Calculations of these incremental costs are shown in Table 36.

Table 36. Incremental Costs to Place Braille Instructions on Certain Types of ICT

Component	Value
Cost per braille label	\$2.50
Number of Federal employees	2,000,000
Average pieces of hardware per employee	0.25
Pieces of hardware requiring braille labels per year	100,000
Costs of braille labels per year	\$250,000
Installation time per braille label (hours)	0.10
Direct labor cost per hour	\$27.25
Multiplier for benefits	1.30
Loaded labor cost per hour	\$35.43
Installation time costs per braille label	\$3.54
Installation time costs per year	\$354,250
Total braille instructions costs (annual)	\$604,250
Present value of Total Braille Instructions Costs, 2018-2027, 7% discount rate	\$3,966,354
Present value of Total Braille Instructions Costs, 2018-2027, 3% discount rate	\$5,004,248

Estimates of the initial and recurring increases in compliance costs for procured ICT developed using this approach are presented in Table 37.

Table 37. Estimates of Increased Costs Associated With Procured ICT (Millions of 2017 Dollars)

Component	Initial Cost			Recurring cost		
	High Cost Scenario	Expected Scenario	Low Cost Scenario	High Cost Scenario	Expected Scenario	Low Cost Scenario
Policy development/implementation	\$96.3	\$48.1	\$24.1	\$9.6	\$4.8	\$0.0
Employee training	\$136.3	\$68.1	\$34.1	\$13.6	\$6.8	\$3.4
Software/Web/audiovisual media development	\$63.0	\$31.5	\$15.8	\$31.5	\$15.8	\$7.9

¹⁵⁷ See figure in “[What is the Life Span of a Laser Printer?](#)” accessed September 12, 2016.



Component	Initial Cost			Recurring cost		
	High Cost Scenario	Expected Scenario	Low Cost Scenario	High Cost Scenario	Expected Scenario	Low Cost Scenario
Software/Web/audiovisual media evaluation/testing	\$15.8	\$7.9	\$3.9	\$15.8	\$7.9	\$3.9
Electronic document and other content creation	\$86.3	\$65.6	\$55.2	\$65.6	\$55.2	\$44.9
Braille instructions	\$0.6	\$0.6	\$0.6	\$0.6	\$0.6	\$0.6
Increase in costs for procured ICT	\$398.3	\$221.9	\$133.7	\$136.7	\$91.1	\$60.7

The initial increase in compliance costs associated with procured ICT is estimated at \$221.9 million (sensitivity analysis range of \$133.7 million to \$398.3 million). Recurring annual compliance costs for procured ICT are estimated to be \$91.1 million (sensitivity analysis range of \$60.7 million to \$136.7 million) higher under the revised Section 508 standards.

Estimates of the 2017 present value of the increase in compliance costs associated with procured ICT during the 10-year analysis period from 2018 through 2027 are presented in Table 38.

Table 38. Present Value in 2017 of Monetized 2018–2027 Costs for Procured ICT (Millions of 2017 Dollars)

Monetized Cost Component	7-Percent Discount Rate			3-Percent Discount Rate		
	High Cost Scenario	Expected Scenario	Low Cost Scenario	High Cost Scenario	Expected Scenario	Low Cost Scenario
Policy development/implementation	\$106.5	\$52.6	\$15.3	\$134.6	\$67.0	\$19.6
Employee training	\$150.8	\$74.5	\$37.0	\$190.5	\$94.8	\$47.3
Software/Web/audiovisual media development	\$185.3	\$91.5	\$45.5	\$234.1	\$116.4	\$58.1
Software/Web/audiovisual media evaluation/testing	\$82.4	\$40.7	\$20.2	\$104.2	\$51.8	\$25.8
Electronic document and other content creation	\$356.4	\$291.9	\$236.8	\$450.3	\$371.4	\$302.5
Braille instructions	\$4.0	\$4.0	\$4.0	\$5.0	\$5.0	\$5.0
Total agency costs	\$885.4	\$555.1	\$358.7	\$1,118.8	\$706.4	\$458.2

The present value of the increased costs during the 10-year analysis period associated with procured ICT is estimated at \$555.1 million (sensitivity analysis range of \$358.7 million to \$885.4 million) using a 7-percent discount rate and \$706.4 million (sensitivity analysis range of \$458.2 million to \$1.1 billion) using a 3-percent discount rate.



As noted in Section 7.2, this estimate of projected cost increases 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, as both higher purchase costs and lower contractor profits represent social costs of the revised Section 508 standards.

10.3. Compliance Costs Associated With Revised Section 255 Guidelines

10.3.1. Conformance Costs for Manufacturers' Web Sites and Content

Telecommunications equipment manufacturers could incur significant incremental costs 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 9.10, several of the largest telecommunications manufacturers appear to have relatively accessible support sections of their public-facing Web sites. However, many others will 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 revised guidelines were estimated as follows:

- According to the 2012 Statistics of U.S. Business, there were 249 telephone apparatus manufacturers (NAICS 33421), 748 radio and television broadcasting and wireless communications equipment manufacturers (NAICS 33422), and 382 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 36 percent of the firms (482) in this sector had 20 or more employees.¹⁵⁸ 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 9.10) 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 will need to be made accessible under the revised guidelines.
- For this analysis, 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

¹⁵⁸ Census Bureau, 2012 SUSB Annual Datasets by Establishment Industry, "U.S., 6-digit NAICS, detailed employment sizes," [Statistics of U.S. Businesses](#).



evaluation.^{159,160} A firm’s number of employees and website complexity are correlated as larger companies have more employees, more traffic and more complex sites.

- These per-firm estimates were modified to take into account the following considerations:
 - The airlines sites were reviewed in 2011, 3 years after WCAG 2.0 was created, and are therefore likely to be substantially less compliant with WCAG 2.0 than the product support sections of the telecommunications equipment manufacturer websites would be in 2016.
 - 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.
- Providing accessible product documentation and support also entails continuing costs as Web support pages are modified or expanded and as new or revised 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 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 estimates of the costs incurred by telecommunications equipment manufacturers to provide accessible electronic product documentation and Web-based support. These conformance costs were calculated as shown in Table 39.

Table 39. Estimated 2018–2027 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	284	501
Average one-time repair cost per firm	\$125,000	\$25,000	\$68,313

¹⁵⁹ The higher percentage of airline Web site accessibility costs assumed for smaller manufacturers takes into account the fact that smaller telecommunications equipment manufacturers will 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.

¹⁶⁰ These figures are based on commenters’ responses as outlined in the [2013 DOT Final Regulatory Analysis](#) for a rulemaking on accessible kiosks and websites. We have not updated these figures because they were estimates in 2013, as well as because there may be offsetting impacts that would either suggest their values may be higher or lower in 2016. Specifically, though inflation from 2013 to 2016 may suggest higher figures than quoted by commenters to the 2013 regulatory evaluation, advances in technology and technological capabilities of airline Web development staff may suggest lower figures than these. For purposes of this analysis, and for these reasons, we use the same 2013 regulatory evaluation one-time cost estimates.



Cost Calculation Element	100 or More Employees*	20 to 99 Employees*	Total
Total one-time costs	\$27,125,000	\$7,100,000	\$34,225,000
Average annual per-firm maintenance cost**	\$25,000	\$5,000	\$13,663
Total annual maintenance costs	\$5,425,000	\$1,420,000	\$6,845,000
Total Web site accessibility costs, 2018–2027			\$88,985,000
Present value of costs in 2017 (millions)***			\$70.37

*Based on the number of NAICS 33421, 33422, and 33411 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 one-third of firms in each size class incur one-time repair costs in each of 2018, 2018, and 2019. Annual maintenance costs begin in 2018 for Web sites made accessible in 2018 and in 2019 for Web sites made accessible in 2018. Present value of costs calculated using a discount rate of 7 percent.

The costs for manufacturers to comply with the revised Section 255 guidelines relating to electronic product documentation and support are estimated at \$34.2 million from 2018 to 2019 and \$89.0 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.

10.4. Summary of Monetized and Unquantified Incremental Costs of the Final Rule

Finally, the costs estimated for in-house ICT (Section 10.1.6), procured ICT (Section 10.2), and telecommunications manufacturers (Sections 10.3) were converted to an annualized basis using discount rates of 7 percent and 3 percent. The annualized costs estimated for the final rule are summarized in Table 40.

Table 40. Annualized Compliance Costs for the Final Rule, 2018–2027 (Millions of 2017 Dollars)

Monetized Benefits and Costs	High Cost Scenario		Expected Scenario		Low Cost Scenario	
	7-Percent Discount Rate	3-Percent Discount Rate	7-Percent Discount Rate	3-Percent Discount Rate	7-Percent Discount Rate	3-Percent Discount Rate
Annualized in-house ICT cost	\$150.1	\$156.2	\$93.8	\$98.3	\$60.4	\$63.5
Annualized cost for procured ICT	\$126.1	\$131.2	\$79.0	\$82.8	\$51.1	\$53.7
Annualized costs of telecommunications manufacturer product support Web site and content development	\$9.5	\$9.6	\$9.5	\$9.6	\$9.5	\$9.6



Monetized Benefits and Costs	High Cost Scenario		Expected Scenario		Low Cost Scenario	
	7-Percent Discount Rate	3-Percent Discount Rate	7-Percent Discount Rate	3-Percent Discount Rate	7-Percent Discount Rate	3-Percent Discount Rate
Annualized value of monetized costs	\$285.7	\$296.9	\$182.4	\$190.7	\$121.0	\$126.8

Collectively, the revisions to the Section 508 standards and Section 255 guidelines have estimated compliance costs of \$182.4 million (sensitivity analysis range of \$121.0 million to \$285.7 million) on an annualized basis over the 10-year analysis period using a 7-percent discount rate and \$190.7 million (sensitivity analysis range of \$126.8 million to \$296.9 million) using a 3-percent discount rate.

There are also several categories of incremental costs that will result from adoption of the final rule that could not be quantified. These costs are listed in Table 41.

Table 41. Unquantified Incremental Costs of the Final Rule

Costs
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.
Potential costs to state and local governments and non-profit organizations that may be required to make electronic content accessible in order to do business with federal agencies.
Potential costs to develop and produce hardware and telecommunications products that comply with revised standards.
Possible social costs from the deletion of existing requirement that Web-based documents and information be organized to be readable without requiring an associated style sheet.
Costs of increased compliance by foreign telecommunications manufacturers shifted to U.S. end users (consumers).

The impact on computer and telecommunications equipment manufacturers from the final 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 again in the NPRM and the PRA. 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 will 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 incremental costs of compliance with the revised ICT standards and guidelines across all of their product lines. The potential impact on consumer prices can be assessed by assuming that these manufacturers will incur compliance costs equal to the entire amount estimated in this analysis for Federal agencies, contractors, and vendors (about \$280 million on an annualized



basis) with the aggregate value of annual shipments in these industries (about \$75.6 billion¹⁶¹). Under this conservative assumption, the incremental compliance costs incurred by computer and telecommunications equipment would still be less than 0.3 percent of the value of shipments.

¹⁶¹ See Table D-4 in Appendix D.



11. Conclusion

This regulatory evaluation indicates that there are substantial benefits and costs associated with updating the current ICT standards and guidelines. The incremental benefits of this final rule that we were able to monetize are estimated at \$72.4 million (sensitivity analysis range of \$32.0 million to \$187.4 million) annually over the 10-year analysis period using a 7-percent discount rate and \$77.0 million (sensitivity analysis range of \$34.0 million to \$199.0 million) annually using a 3-percent discount rate. The incremental costs of this final rule that we were able to monetize are estimated at \$182.4 million (sensitivity analysis range of \$121.0 million to \$285.7 million) annually over 10 years using a 7-percent discount rate and \$190.7 million (sensitivity analysis range of \$126.8 million to \$296.9 million) using a 3-percent discount rate. The incremental monetized benefits and costs of the final rule are shown in Table 42.

Table 42. Annualized Value of Monetized Benefits and Costs, 2018–2027 (Millions of 2017 Dollars)

Monetized Benefits and Costs	Low Net Benefit Scenario		Expected Scenario		High Net Benefit Scenario	
	7-Percent Discount Rate	3-Percent Discount Rate	7-Percent Discount Rate	3-Percent Discount Rate	7-Percent Discount Rate	3-Percent Discount Rate
Benefits from increased Federal employee productivity	\$18.2	\$19.3	\$47.7	\$50.6	\$151.8	\$160.9
Benefits from improved Federal Government Web site accessibility to people with addressable disabilities	\$2.8	\$3.0	\$2.8	\$3.0	\$2.8	\$3.0
Benefits to Federal agencies from reduced call volumes	\$10.9	\$11.7	\$21.9	\$23.4	\$32.8	\$35.1
Annualized value of monetized benefits	\$32.0	\$34.0	\$72.4	\$77.0	\$187.4	\$199.0
In-house ICT costs	\$150.1	\$156.2	\$93.8	\$98.3	\$60.4	\$63.5
Procured ICT costs	\$126.1	\$131.2	\$79.0	\$82.8	\$51.1	\$53.7



Monetized Benefits and Costs	Low Net Benefit Scenario		Expected Scenario		High Net Benefit Scenario	
	7-Percent Discount Rate	3-Percent Discount Rate	7-Percent Discount Rate	3-Percent Discount Rate	7-Percent Discount Rate	3-Percent Discount Rate
Costs of telecommunication s manufacturer product support Web site and content development	\$9.5	\$9.6	\$9.5	\$9.6	\$9.5	\$9.6
Annualized value of monetized costs	\$285.7	\$296.9	\$182.4	\$190.7	\$121.0	\$126.8

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

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 final 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 determination that the costs of the 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 revised 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 revised 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/plugin-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.¹⁶²

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 preamble and final rule explain 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 final rule 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,

¹⁶² 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](#)," updated March 19, 2012.



the ability to turn off background audio that might interfere with comprehension, and compatibility with screen reading software.

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, as well as the corresponding current Section 508 reference or notation of a new reference, as applicable.

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

Success Criterion	Heading	Level	Corresponding 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 contain 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.



Success Criterion	Heading	Level	Corresponding 508 Reference	Description
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.
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 ensuring that the user can navigate to and away from all navigable page elements using only a keyboard typically, by using tab and shift-tab.
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.



Success Criterion	Heading	Level	Corresponding 508 Reference	Description
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.
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.



Success Criterion	Heading	Level	Corresponding 508 Reference	Description
3.2.1	On Focus	A	New	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 printer icon at the top of each page should always be labeled the same way.
3.3.1	Error Identification	A	1194.21(l) and .22(n)	Form fields that require responses in a specific format, value, or length provide this information in a way that is readily available to assistive technology (e.g., within the element's label or within the element's title attribute). When form validation errors are presented, they must be available in plain text.
3.3.2	Labels or Instructions	A	1194.21(l) and .22(n)	Sufficient labels, cues, and instructions for required interactive elements are provided e.g., instructions, examples, properly positioned form labels, or fieldsets and legends.
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.
3.3.4	Error Prevention (Legal, Financial, Data)	AA	New	If the user can change or delete legal, financial, or test data, those changes or deletions can be reversed, verified, or confirmed.
4.1.1	Parsing	A	New	Significant HTML/XHTML validation/parsing errors are avoided.



Success Criterion	Heading	Level	Corresponding 508 Reference	Description
4.1.2	Name, Role, Value	A	1194.21(d)	User interface components have their name and role available to assistive technology. The values (including states and properties) of interface components that can be changed by the user are also available to assistive technology

Source: Adapted from [WebAIM.org WCAG 2.0 checklist for HTML documents](http://WebAIM.org). Section 508 references are from the Access Board staff standards comparison table referenced in the final rule.

A.1.1. 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:¹⁶³

- 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 revised “[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 requirements for one specific type of electronic documents—those stored in PDF—are established by referencing the applicable ISO standard. PDF/UA-1 provides a technical, interoperable standard for the authoring, remediation, and validation of PDF content.¹⁶⁴

¹⁶³ W3C, “[Guidance on Applying WCAG 2.0 to Non-Web Information and Communications Technologies](#),” Working Draft, September 5, 2013. 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.”

¹⁶⁴ [ISO 14289-1 \(2014\), Document Management Applications—Electronic Document File Format Enhancement for Accessibility—Part 1: Use of ISO 32000-1 \(PDF/UA-1\)](#).



A.2. Additional Final Rule Requirements for Software and Applications

The final rule includes three sets of additional specific requirements for certain types of software and applications: interoperability with AT, non-Web software applications, and authoring tools.¹⁶⁵

Table A-2. Final Rule Requirements for Software

Final Rule Reference	Heading	Corresponding 508 Reference	Requirement Stated in Reference
CHAPTER 5: SOFTWARE			
502 Interoperability With Assistive Technology			
502.2	Documented Accessibility Features	1194.21(b)	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)	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)	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.
502.3.3	Row, Column, and Headers	1194.22(g) and (h)	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.
502.3.4	Values	Expanded from 1194.21 (a) and (d) (current practice)	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.
502.3.6	Label Relationships	Expanded from 1194.21(a)(l) and 1194.22(n)(current practice)	Product functions shall be executable from a keyboard. 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.

¹⁶⁵ Web applications that conform to all Level A and Level AA Success Criteria and all Conformance Requirements in WCAG 2.0 will not be required to conform to the provisions that address interoperability with AT and requirements for applications.



Final Rule Reference	Heading	Corresponding 508 Reference	Requirement Stated in Reference
502.3.7	Hierarchical Relationships	Expanded from 1194.21(a)(l) and 1194.22(n)	Product functions shall be executable from a keyboard. 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.
502.3.8	Text	1194.21(f)	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.
502.3.10	List of Actions	New (current practice)	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.
502.3.12	Focus Cursor	1194.21(c)	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)	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	Specifies requirements for core accessibility features available in platforms (harmonized with accepted industry practices).
503 Applications			
503.2	User Preferences	1194.21(g)	Applications shall not override user-selected contrast and color selections and other individual display attributes.
503.3	Alternative User Interfaces	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	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			



Final Rule Reference	Heading	Corresponding 508 Reference	Requirement Stated in Reference
504.2	Content Creation or Editing	New	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)	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.
504.3	Prompts	New	Authoring tools would be required to include a feature to provide prompts that proactively support the creation of accessible content.
504.4	Templates	New	Where templates are provided, authoring tools would be required to provide a range of templates that facilitate accessible content creation.

*W3C, ATAG, version 2.0.¹⁶⁶

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

A.3. Final Rule 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 revised 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 revised requirements for hardware and telecommunication equipment is provided in Table A-3.

¹⁶⁶ W3C ATAG version 1.0 was approved in February 2000. ATAG 2.0, which was developed to be compatible with WCAG 2.0, became a stable consensus recommendation in September 2015.



Table A-3. Final Rule Requirements for Hardware and Telecommunications Equipment

Final Rule Reference	Heading	508 Reference	255 Reference	707 Reference	Requirements Stated in Reference
CHAPTER 4: HARDWARE					
402 Closed Functionality	<i>(The requirements in this section are not applicable to the components of telecommunications and customer premises equipment.) (C204.1 Exception)</i>				
402.1	General	1194.25(a)	*Excepted	Not Applicable	Requires products with closed functionality to be operable without needing to attach assistive technology to the product.
402.2	Speech Output Enabled	New	*Excepted	707.5	Requires ICT with a display screen to allow a user to enable speech-output for full and independent use by individuals with vision impairments. Several exceptions are allowed and specified.
402.2.1	Information Displayed On-Screen	New	*Excepted	707.5	Requires speech output for all information displayed on-screen.
402.2.2	Transactional Outputs	New	*Excepted	707.5.2	Requires ICT to provide speech output for all information necessary to verify transactions.



Final Rule Reference	Heading	508 Reference	255 Reference	707 Reference	Requirements Stated in Reference
402.2.3	Speech Delivery Type and Coordination	New	*Excepted	707.5	Requires: (1) speech output to be delivered in a mechanism that is readily available to all users, such as a headset jack or a telephone handset; (2) speech to be recorded, digitized human, or synthesized; and (3) the speech output to be coordinated with information on the screen.
402.2.4	User Control	1194.25(e)	*Excepted	707.5.1	Requires speech out to be interrupted when a transaction is selected and to be capable of being repeated and paused.
402.2.5	Braille Instructions	New	*Excepted	707.8	Requires braille instructions for initiating the speech mode.
402.3	Volume	New	*Excepted	707.5.1	Requires ICT delivering speech output or any sound to provide volume control.
402.3.1	Private Listening	1194.25(e)	*Excepted	Does not specify hearing aid compatibly	Requires ICT including private listening (e.g., ICT using headset jack or handset-type audio inducer) to allow volume control by end users; and requires ICT using handset-type audio inducer to be compatible with hearing aids.



Final Rule Reference	Heading	508 Reference	255 Reference	707 Reference	Requirements Stated in Reference
402.3.2	Non-Private Listening	1194.25(f) and .23(g)	*Excepted	Does not specify amplification level and volume reset.	Requires ICT including non-private listening (e.g., using speakers) to offer incremental volume control with amplification up to a level of at least 65 as well as a function for automatic reset of volume to the default level.
402.4	Characters on Display Screens	New	*Excepted	707.7.2	Requires characters on the screen to be written in a sans serif font at least 3/16-inch (4.8 mm) high and to contrast with their background—with either light characters on a dark background or dark characters on a light background.
402.5	Characters on Variable Message Signs	New	*Excepted	Does not specify conformance to ICC A117.1-2009.	Requires characters on variable message signs to conform to section 703.7 Variable Message Signs of ICC A117.1-2009 (incorporated by reference in the final rule).



Final Rule Reference	Heading	508 Reference	255 Reference	707 Reference	Requirements Stated in Reference
403 Biometrics					
403.1	General	1194.25(d) and .26(c)	New	Does not mention biometrics.	Prohibits ICT from using one biometric option as the only means for user id and control. Instead, ICT would be required to offer at least two biometric options for user identification or control.
404 Preservation of Information Provided for Accessibility					
404.1	General	1194.23(j)	1193.37	Not applicable	Prohibits ICT that transmits or converts information or communication from removing information provided for accessibility.
405 Privacy					
405.1	General		1193.43(f)	707.4	Requires the same degree of privacy of input and output to be provided to all users.
406 Standard Connections					
406.1	General	1194.26(d)	1193.51(a)	Not applicable	Requires that, where provided, at least one type of data connection conforms to industry standard non-proprietary formats.



Final Rule Reference	Heading	508 Reference	255 Reference	707 Reference	Requirements Stated in Reference
407 Operable Parts					
407.1	General	1194.23(k), 1194.25(c), 1194.26(b)	1193.41(a), (c), (e), (f), (g)	707.3	A charging statement that where provided, operable parts of ICT would have to conform to the standards under section 407.
407.2	Contrast	New	1193.41(c)	707.6.3.1	Requires keys and controls to contrast visually from background surfaces. In other words, light-colored characters or symbols would have to be placed on a dark background, and dark-colored characters or symbols on a light background.
407.3	Tactilely Discernible	1194.23(k)(1) , 1194.25(c), 1194.26(b)	1193.41(a)	707.6.1	Except for personal use devices that are audibly discernible without activation, other ICT would have to have at least one tactilely discernible input control for each function.
407.3.1	Identification	1194.23(k)(1)	New	707.6.1	Requires input controls to be tactilely discernible without activation and operable by touch; and requires key surfaces outside active areas of display screens to be raised above surrounding surfaces.



Final Rule Reference	Heading	508 Reference	255 Reference	707 Reference	Requirements Stated in Reference
407.3.2	Alphabetic Keys	New	New	Does not specify	Requires alphabetic keys to be arranged in a QWERTY keyboard layout with the “F” and “J” keys being tactilely distinct.
407.3.3	Numeric Keys	New	New (industry standard)	707.6.2	Requires numeric keys to be arranged in a 12-key ascending or descending telephone keypad layout with the number five key tactilely distinct.
407.4	Key Repeat	1194.23(k)(3)	1193.41(g)	Does not specify	Requires the delay before the key repeat feature to be fixed at, or adjustable to, at least 2 seconds.
407.5	Timed Response	1194.23(d), 1194.25(b)	1193.41(g)	Does not specify	Requires ICT to alert the user visually and by either touch or sound and to offer an opportunity to indicate that more time is needed.
407.6	Operation	1194.23(k)(2)	1193.41(e), (f)	309.4 (from 707.3 reference to 309)	Requires at least one mode of operation to be doable with one hand without grasping, pinching, or twisting of the wrist. Also, limits the force required to activate operable parts to be 5 lbs. (22.2 N) maximum.



Final Rule Reference	Heading	508 Reference	255 Reference	707 Reference	Requirements Stated in Reference
407.7 <i>*The requirements in this section are not applicable to components of telecommunications and customer premises equipment. (C204.1 Exception)</i>	Tickets, Fare Cards, and Keycards	New	New	Does not specify	Requires the orientation of keys, tickets, and cards to be tactilely discernable, if their orientation is important to further use.
407.8 <i>*The requirements in this section and subsequent subsections are not applicable to components of telecommunications and customer premises equipment. (C204.1 Exception)</i>	Reach Height	1194.25(j)	*Excepted	309.3 (from 707.3 reference to 309)	Requires at least one of each type of operable part of stationary ICT to be placed within the specified height and reach range for a forward or side approach by a wheelchair user.
407.8.1	Vertical Reference Plane	1194.25(j)	*Excepted	308 (from 707.3 reference to 309, and 309.3 reference to 308)	Requires operable parts to be positioned for a side or forward reach.
407.8.1.1	Vertical Plane for Side Reach	1194.25(j)(1)	*Excepted	308.3 (from 707.3 reference to 309, and 309.3 reference to 308)	Requires vertical reference plane for a side reach to be at least 48 inches (1.22 m).
407.8.1.2	Vertical Pane for Forward Reach	New	*Excepted	308.2 (from 707.3 reference to 309, and 309.3 reference to 308)	Requires vertical reference plane for a forward reach at least 30 inches (0.76 m).



Final Rule Reference	Heading	508 Reference	255 Reference	707 Reference	Requirements Stated in Reference
407.8.2	Side Reach	1194.25(j)(1)	*Excepted	308.3.2 (from 707.3 reference to 309, and 309.3 reference to 308)	Requires the vertical reference plane to be centered on the operable part and to be placed at the leading edge of any protrusion. Also, limits the height of a portion of ICT reached over to 34 inches (.865 m) high maximum.
407.8.2.1	Unobstructed Side Reach	1194.25(j)(2)	*Excepted	308.3.1 (from 707.3 reference to 309, and 309.3 reference to 308)	For an unobstructed side reach, operable parts are between 48 inches (1.22 m) and 15 inches (.38 m) above the floor.
407.8.2.2	Obstructed Side Reach	1194.25(j)(3), 1194.25(j)(4)	*Excepted	308.3.2 (from 707.3 reference to 309, and 309.3 reference to 308)	For an obstructed side reach, operable parts are between 46 inches (1.17 m) and 15 inches (.38 m) above the floor, and not more than 24 inches (.610 m) beyond the vertical reference plane.
407.8.3	Forward Reach	New	*Excepted	308.2 (from 707.3 reference to 309, and 309.3 reference to 308)	The vertical reference plane is centered on and intersects with the operable part. Anything being reached over is no more than 34 inches (.865 m) high.



Final Rule Reference	Heading	508 Reference	255 Reference	707 Reference	Requirements Stated in Reference
407.8.3.1	Unobstructed Forward reach	New	*Excepted	308.2.1 (from 707.3 reference to 309, and 309.3 reference to 308)	For an unobstructed forward reach, operable parts would have to be between 48 inches (1.22 m) maximum and 15 inches (.38 m) minimum above the floor.
407.8.3.2	Obstructed Forward Reach	New	*Excepted	308.2.2 (from 707.3 reference to 309, and 309.3 reference to 308)	The maximum allowable obstructed forward reach to an operable part would have to be 25 inches (0.635 m).
407.8.3.2.1	Operable part Height for ICT with Obstructed Forward Reach	New	*Excepted	308.2.2 (from 707.3 reference to 309, and 309.3 reference to 308)	Depending on the reach depths, different heights are required. For example, the high forward reach would have to be no more than 48 inches (1.22 m) where the reach depth is less than 20 inches (0.51 m).
407.8.3.2.2	Knee and Toe Space under ICT with Obstructed Forward Reach	New	*Excepted	306 (from 707.3 reference to 309, 309.2 reference to 305, and 305.4 reference to 306)	Requires knee and toe space under ICT is clear of obstructions and provides specific height, depth, and width dimensions.



Final Rule Reference	Heading	508 Reference	255 Reference	707 Reference	Requirements Stated in Reference
408 Display Screens	<i>*The requirements in this section are not applicable to components of telecommunications and customer premises equipment. (C204.1 Exception)</i>				
408.1 408.2	General Visibility	New	*Excepted	707.7.1	Requires at least one display screen (if more than one screens are offered) visible from a point located 40 inches (1.015 m) above the center of the floor space.
408.3	Flashing	1194.25(i)	1193.43(f)	Does not specify	No more than three flashes are allowed in any 1-second period.
409 Status Indicators					
409.1	General	1194.23(k)(4)	1193.41(a)	Does not specify	Requires status indicators to be visually discernible and either tactile or audible.



Final Rule Reference	Heading	508 Reference	255 Reference	707 Reference	Requirements Stated in Reference
410 Color Coding					
410.1	General	1194.25(g)	1193.41(c)	Does not specify	Prohibits color coding as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.
411 Audible Signals					
411.1	General	New	New	Does not specify	Prohibits audio signaling as the only means of conveying information, indicating an action, or prompting a response.
412 ICT With Two-Way Voice Communication					
412.2	Volume Gain	1194.23(f)	1193.43(e)	Does not specify	Requires volume gain to be provided and for wireline phones, to meet the requirements of 47 CFR 68.317, "Hearing Aid Compatibility Volume Control: Technical Standards."
412.3	Interference Reduction and Magnetic Coupling	1194.23(h)	1193.43(i)	Does not specify	Requires ICT that uses a handset or similar device for audio output to work with hearing technologies and provide effective communication.
412.3.1	Wireless Handsets	1194.23(i)	1193.43(h)	Does not specify	Requires wireless handsets to meet the requirements of ANAI/IEEE C63.19-2011



Final Rule Reference	Heading	508 Reference	255 Reference	707 Reference	Requirements Stated in Reference
412.3.2	Digital Wireline	1194.23(i)		Does not specify	Requires digital wireline devices to satisfy the requirements of TIA 1083.
412.4	Digital Encoding of Speech	New (industry standard)	New (industry standard)	Does not specify	Requires ICT in IP-based networks to transmit and receive speech as specified by ITU-T Recommendation G.722.2 or IETF RFC 6716.
412.5	Real-Time Text Functionality [RESERVED]	New	New	Does not specify	
412.6	Caller ID	1194.23(e)	New	Does not specify	Requires caller identification and similar telecommunication s functions, if provided, to be visible and audible
412.7	Video Communication	New	New	Does not specify	Requires ICT providing real-time video functionality to offer sufficient video quality to support sign-language communication.
413 Closed Caption Processing Technologies					
413.1	General	1194.24(a)	1193.37	Does not specify	A charging statement that ICT displaying or processing video with synchronized audio meet the requirements listed under section 413.
413.1.1	Decoding of Closed Captions	1194.24(a)	1193.37	Does not specify	Requires players and displays to decode closed caption data and support display of captions.



Final Rule Reference	Heading	508 Reference	255 Reference	707 Reference	Requirements Stated in Reference
413.1.2	Pass-Through of Closed Caption Data	1194.23(j)	1193.37	Does not specify	Requires cabling and ancillary equipment to pass through caption data.
414 Audio Description Processing Technology					
414.1	General	1194.24(b)	New	Does not specify	Requires ICT that displays or processes video with synchronized audio to provide a mode of operation that plays associated audio description.
414.1.1-414.1.2	Digital Television Tuners	New	New	Does not specify	Requires audio description played through digital television tuners to conform to ATSC A/53.
415 User Controls for Captions and Audio Description	<i>*The requirements in this section are not applicable to components of telecommunications and customer premises equipment. (C204.1 Exception)</i>				
415.1.1	Caption Controls	New	*Excepted	Does not specify	Requires that where ICT provides operable parts for volume control, operable parts for caption control must also be provided.



Final Rule Reference	Heading	508 Reference	255 Reference	707 Reference	Requirements Stated in Reference
415.1.2	Audio Description Controls	New	*Excepted	Does not specify	Requires that where ICT provides operable parts for program selection, operable parts for selection of audio description must also be provided.

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

A.4. Final Rule 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. Final Rule Accessibility Requirements for Support Documentation and Services

Final Rule Reference	Heading	508 Reference	255 Reference	Paraphrase of Requirement from Reference
CHAPTER 6: SUPPORT DOCUMENTATION AND SERVICES				
602 Support Documentation				
602.2	Accessibility and Compatibility Features	1194.41(b)	1193.33	Requires documentation to list and explain how to use the ICT features listed under the 255/508 technical requirements. Requires also documentation to explain built-in accessibility features as well as accessibility features' compatibility with assistive technology.
602.3	Electronic Support Documentation	New	New	Requires support documentation in electronic format, including Web-based self-service support to satisfy WCAG 2.0 (Levels A and AA).



Final Rule Reference	Heading	508 Reference	255 Reference	Paraphrase of Requirement from Reference
602.4	Alternative Formats for Non-Electronic Support Documentation	1194.41(a)	1193.33(a)(2)	Requires that where support documentation is only provided in non-electronic formats, alternate formats usable by individuals with disabilities must be provided upon request.
603 Support Services				
603.2	Information on Accessibility and Compatibility Features	New	1193.33(a)(3)	Requires ICT support services to include information on accessibility and compatibility features.
603.3	Accommodation of Communication Needs	1194.41(c)	1193.33	Requires ICT support services to accommodate the communication needs of individuals with disabilities.

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

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

Table A-5 identifies specific provisions in the final 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. Final 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			
302.9 With Limited Language, Cognitive, and Learning Abilities							X	
402 Closed Functionality, 402.1 General, 402.2 Speech-Output Enabled	X	X					X	
402.2.1 Information Displayed On-Screen	X						X	
402.2.2 Transactional Outputs	X							
402.2.3 Speech Delivery Type and Coordination	X	X					X	
402.2.4 User Control	X	X					X	
402.2.5 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 on Display Screens		X						
402.5 Characters on Variable Message Signs		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 Privacy, 405.1 General	X	X						
406 Standard Connections, 406.1 General	X			X	X			X
407 Operable Parts, 407.1 General	X	X	X	X	X			
407.2 Contrast		X						
407.3 Input Controls (and sub-provisions)	X							
407.4 Key Repeat					X			



Provision Number and Title	Blind	LV	Deaf	HoH	Motor	Speech	CLL	Photo
407.5 Timed Response	X	X			X		X	
407.6 Operation					X			
407.7 Keys, Tickets, and Fare Cards	X							
407.8 Reach Height (and sub-provisions)					X			
408 Display Screens, 408.1 General, 408.2 Visibility					X			
408.3 Flashing							X	
409 Status Indicators, 409.1 General	X						X	
410 Color Coding, 410.1 General		X					X	
411 Audible Signals, 411.1 General			X	X			X	
412 ICT With Two-Way Voice Communication, 412.1 General	X		X	X	X			
412.2 Volume Gain				X				
412.3 Interference Reduction and Magnetic Coupling (and sub-provisions)				X				
412.4 Digitally Encoded Speech				X				
412.5 Real-Time Text Functionality (Reserved)			-	-				
412.6 Caller ID	X	X	X	X				
412.7 Video Communication			X					
413 Caption Processing Technologies, 411.1 General (includes sub-provisions)			X	X				
414 Audio Description Processing Technology, 412.1 General (includes sub-provisions)	X							
415 User Controls for Captions and Audio Description, 413.1 General (and sub-provisions)	X		X	X				
502 Interoperability With Assistive Technology, 502.1 General	X	X	X	X	X		X	
502.2 Documented Accessibility Features (and sub-provisions)	X		X	X	X		X	
502.3 Accessibility Services (and sub-provisions)	X				X			
502.4 Platform Accessibility Features	X	X	X	X	X		X	
A. Section 9.3.3 Enable sequential entry of multiple (chorded) keystrokes					X			



Provision Number and Title	Blind	LV	Deaf	HoH	Motor	Speech	CLL	Photo
B. Section 9.3.4 Provide adjustment of delay before key acceptance					X			
C. Section 9.3.5 Provide adjustment of same-key double-strike acceptance					X			
D. Section 10.6.7 Allow users to choose visual alternative for audio output			X	X				
E. Section 10.6.8 Synchronize audio equivalents for visual events		X		X			X	
F. Section 10.6.9 Provide speech output services	X	X				X	X	
G. 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				
504.2.2 PDF Export	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 this 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 2010 SIPP included a special section on functional disabilities that was used to develop estimates of the proportion of the U.S. civilian non-institutional population in selected age groups who have hearing, vision, or ambulatory disabilities. Additional questions provide data on use of hearing aids and wheelchairs.¹⁶⁷ 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 revised ICT standards (people with “addressable disabilities”). Selected results from the 2010 SIPP data are presented in Table B-1.¹⁶⁸

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

Nature of Disability	Age 15–64	Age 15–64	Age 65 and over	Age 65 and over	Age 15 and over	Age 15 and over
	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%

¹⁶⁷ 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.”

¹⁶⁸ 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 updated 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.



Nature of Disability	Age 15–64	Age 15–64	Age 65 and over	Age 65 and over	Age 15 and over	Age 15 and over
	Number	Percent	Number	Percent	Number	Percent
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%
Learning/intellectual disability	4,803,000	2.4%	362,000	0.9%	5,165,000	2.1%
Learning disability	3,610,000	1.8%	286,000	0.7%	3,896,000	1.6%
Intellectual disability	1,193,000	0.6%	76,000	0.2%	1,269,000	0.5%
People with ICT-addressable disabilities***	19,166,000	9.4%	14,651,000	38.0%	33,817,000	14.0%
Total U.S. population in age group	203,083,000		38,599,000		241,682,000	
Percent of total U.S. population in age group	9.4%		38.0%		14.0%	

*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, difficulty grasping, or learning/intellectual disability.

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 19.2 million people age 15 to 64 and 14.7 million people age 65 and over in 2010 had disabilities that can potentially be addressed by ICT accessibility requirements. This includes people with learning disabilities as noted in Table A-5 (Appendix A). 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.¹⁶⁹
- Persons with photosensitivity-based seizure disorders: SIPP data does not separately categorize persons with seizure disorders. There are two requirements in the final 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.¹⁷⁰ 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.¹⁷¹

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 2010.¹⁷²
- 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.¹⁷³

¹⁶⁹ 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](#).

¹⁷⁰ 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).

¹⁷¹ Centers for Disease Control and Prevention, “Epilepsy Fast Facts” (2012).

¹⁷² 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.

¹⁷³ 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.



- 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.¹⁷⁴

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

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	19,166,000	14,651,00	33,817,000
Estimated percentage of people with addressable disabilities online	52.4%	22.2%	39.3%
People with addressable disabilities online	10,044,380	3,254,290	13,298,669
People with vision disabilities online	2,250,893	840,060	3,090,953
People with other addressable disabilities online	7,793,487	2,414,229	10,207,716
People with addressable disabilities online who use Federal Government websites (assumed 82% of people with addressable disabilities online)	8,236,391	2,668,518	10,904,909

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”).¹⁷⁵

¹⁷⁴ 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.

¹⁷⁵ 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



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	1,019
Mental illness	5,399	0
Other disabilities***	50,048	0
Disability not listed	17,673	0
Federal employees with disabilities	145,035	37,300
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 37,000 Federal civilian employees in 2010 reported having speech, hearing, vision, paralysis, fine motor skill, or cognitive limitations that are potentially addressed by the current and revised 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.¹⁷⁶

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.

¹⁷⁶ 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 2012.¹⁷⁷ 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 508.¹⁷⁸ 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).

¹⁷⁷ 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.

¹⁷⁸ 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%



C.7.1. 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 2015.

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

Federal Agency	FY 2015 Actual	FY 2016 Actual	FY 2017 Budget
Major Civilian Agencies	\$49,968	\$50,725	\$51,299
DOD	\$36,727	\$37,987	\$38,551
Total for Federal Government	\$86,692	\$88,712	\$89,850

Source: White House, "President's IT Budget for FY 2017," February 25, 2016.

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.¹⁷⁹

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 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

¹⁷⁹ 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, GSA, 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.



2012.¹⁸⁰ 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 2015 are presented in Table D-2.

Table D-2. Federal Purchases From Selected ICT Sectors, Calendar Year (CY) 2015

NAICS Code and Description	Number of Purchases	Millions of Dollars
Computer and electronic product manufacturing		
334111 Electronic computers	25,873	\$2,130
334112 Computer storage devices	2,627	\$106
334113 Computer terminals	90	\$6
334119 Other computer peripheral equipment	1,994	\$131
334210 Telephone apparatus	7,145	\$1,258
334220 Radio and television broadcasting and wireless communications equipment	16,096	\$2,867
334290 Other communications equipment manufacturing	9,695	\$1,840
334310 Audio and video equipment	3,774	\$130
Manufacturing subtotal	67,294	\$8,467
Information services		
511210 Software publishers	16,703	\$1,698
514210/518210 Data processing, hosting, and related services	5,937	\$2,087
516110/519130 Internet publishing, broadcasting, and Web search portals	3,220	\$132
518111 Internet service providers and Web search portals	466	\$72
5121 Motion picture and video industries	1,422	\$55
5122 Sound recording industries	193	\$46
5141 Information services	2	\$0
513 Telecommunications services	119	\$4
515 Broadcasting/cable services	3,216	\$34
517 Telecommunications services	45,541	\$5,431
Information services subtotal	76,819	\$9,559

¹⁸⁰ 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.



NAICS Code and Description	Number of Purchases	Millions of Dollars
Office equipment rental and leasing		
532420 Office equipment rental and leasing	5,046	\$417
Rental and leasing subtotal	5,046	\$417
Computer systems design and related services		
541511 Custom computer programming services	18,794	\$4,772
541512 Computer systems design services	24,712	\$15,683
541519 Other computer-related services	62,050	\$12,335
Computer services subtotal	105,556	\$32,790
Total IT purchases	254,715	\$51,233

Source: Econometrica tabulations of downloaded CY 2015 Federal Procurement Data System data.

Table D-2 shows that computer systems design and related services accounted for \$32.8 billion of the \$51.2 billion of total Federal IT purchases in 2015. Hardware purchases totaled \$8.5 billion in 2015, and information services accounted for \$9.6 billion in Federal ICT purchases. Telecommunications services accounted for the majority of Federal information services purchases (\$5.4 billion of the \$9.6 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 2015 OPM employment and salary data for selected occupations are presented in Table D-3.

Table D-3. Federal Employment in Selected Occupations, 2015

Occupation (Code)	Number of Employees	Average Salary
IT-related occupations		
Information Technology (2200)	82,801	\$97,665
IT subtotal	82,801	\$97,665
Contracting-related occupations		
Contracting (1102)	36,971	\$90,013
Purchasing (1105)	3,051	\$49,145
Procurement technician (1106)	1,354	\$47,153
Contracting subtotal	41,376	\$85,597
Document/content producer occupations		
Audiovisual production (1071)	1,109	\$86,009
Writing and editing (1082)	1,204	\$92,118
Technical writing and editing (1083)	1,151	\$83,328
Visual information (1084)	1,686	\$80,608
Editorial assistance (1085)	121	\$49,027
Document/content producer subtotal	5,271	\$84,242



Occupation (Code)	Number of Employees	Average Salary
Other occupations likely to have Section 508 compliance obligations		
Program management (0340)	15,433	\$132,410
Administrative officer (0341)	9,165	\$81,755
EEO compliance (0360)	1,295	\$97,566
EEO assistance (0361)	248	\$49,986
Human resource management (0201)	28,624	\$85,732
Human resource assistance (0203)	10,976	\$43,823
Mediation (0241)	184	\$121,017
Training (0243)	87	\$95,386
Labor management relations (0244)	257	\$110,313
EEO (0260)	2,774	\$95,293
Other selected occupation subtotal	69,043	\$89,651
Total employees in selected occupations	198,491	
IT percentage of total	42%	
Contracting percentage of total	21%	

Source: Tabulations of December 2015 OPM FedScope Employment Data “cube.”

Of the approximately 200,000 Federal employees in these selected occupations, 42 percent (82,801) work in IT. 21 percent (41,376) work in contracting and 3 percent (5,271) work in document/content-producing jobs. It should be noted that in addition to the remaining categories of Federal employees shown in Table D-3, contracting and other Federal employees are required to prepare or participate in the creation of Section 508-compliant materials in the course of the regular performance of their duties. These employees are included in Section 7. IT and document/content-producing workers are also required to design, create, maintain, or repair accessible ICT.

D.4. ICT Manufacturing

The Census Bureau released 2012 Economic Census data for the computer, telecommunications, and audio/video equipment manufacturing sectors. Selected data are presented Table D-4.¹⁸¹

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

¹⁸¹ Estimates of the numbers of ICT firms from the 2013 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.



6-Digit NAICS Code and Description	Number of Companies	Number of Employees	Primary Product Shipments (Millions)
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, 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.¹⁸²

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 revised Section 508 standards or Section 255 guidelines.

¹⁸² Census Bureau, Current Industrial Reports, [MQ334R - Computers and Peripheral Equipment](#), June 2011, and [MQ334P - Telecommunications](#), July 2011.



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.¹⁸³ Private-sector IT employment and salary data for 2015 are summarized in Table D-5.

Table D-5. Private-Sector Employment in IT-Related Occupations, 2015

SOC Code*	Occupation	Number of Employees	Average Salary
151111	Computer and information research scientists	25,510	\$115,580
151121	Computer systems analysts	556,660	\$90,180
151131	Computer programmers	289,420	\$84,360
151132	Software developers applications	747,730	\$102,160
151133	Software developers systems software	390,750	\$108,760
151141	Database administrators	113,770	\$84,250
151142	Network and computer systems administrators	374,480	\$82,200
151150	Computer support specialists	769,630	\$55,980
151122	Information security analysts	88,880	\$93,250
151134	Web Developers	127,070	\$70,660
151143	Computer Network Architects	146,600	\$103,100
151199	Computer occupations (all other)	223,370	\$87,310
	Total	3,853,870	\$86,091
	Software developers (151132/151133)	1,138,480	\$104,425

*BLS Standard Occupational Classification code.

Source: BLS Occupational Employment Statistics for May 2015.

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 \$104,425 and \$70,660, respectively, in 2015.

¹⁸³ BLS, “[May 2015 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 Incremental Benefits and Costs

The annual values of the incremental benefits estimated in Section 6 are shown in Table E-1.

Table E-1. Annual Value of Incremental Monetized Benefits, 2018–2027 (Millions)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2018-2027
Benefits from increased Federal employee productivity	\$19.6	\$39.1	\$58.7	\$58.7	\$58.7	\$58.7	\$58.7	\$58.7	\$58.7	\$58.7	\$528.5
Benefits from improved Federal Government Web site accessibility to people with vision disabilities	\$0.9	\$2.0	\$3.1	\$3.2	\$3.3	\$3.5	\$3.6	\$3.8	\$4.0	\$4.1	\$31.5
Benefits to Federal Agencies from reduced call volumes	\$7.4	\$15.4	\$24.1	\$25.1	\$26.2	\$27.3	\$28.5	\$29.7	\$31.0	\$32.3	\$246.9
Total monetized benefits	\$27.9	\$56.5	\$85.8	\$87.0	\$88.2	\$89.5	\$90.8	\$92.2	\$93.7	\$95.2	\$806.9
Present value in 2017 (7% discount rate)	\$24.3	\$46.1	\$65.5	\$62.0	\$58.8	\$55.7	\$52.9	\$50.2	\$47.6	\$45.2	\$508.4
Present value in 2017 (3% discount rate)	\$26.3	\$51.7	\$76.3	\$75.1	\$73.9	\$72.8	\$71.7	\$70.7	\$69.7	\$68.7	\$656.8
Annualized value (7% discount rate)	\$72.4	\$72.4	\$72.4	\$72.4	\$72.4	\$72.4	\$72.4	\$72.4	\$72.4	\$72.4	\$72.4
Annualized value (3% discount rate)	\$77.0	\$77.0	\$77.0	\$77.0	\$77.0	\$77.0	\$77.0	\$77.0	\$77.0	\$77.0	\$77.0

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



The annual values of the incremental costs estimated in Section 10 are shown in Table E-2.

Table E-2. Annual Value of Incremental Monetized Costs, 2018–2027 (Millions)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2018-2027
Total in-house ICT cost	\$87.3	\$87.3	\$87.3	\$108.2	\$108.2	\$108.2	\$108.2	\$108.2	\$108.2	\$108.2	\$1,019.5
Procured ICT cost	\$73.6	\$73.6	\$73.6	\$91.1	\$91.1	\$91.1	\$91.1	\$91.1	\$91.1	\$91.1	\$858.5
Manufacturers Web site and content development	\$13.7	\$16.0	\$18.3	\$6.8	\$6.8	\$6.8	\$6.8	\$6.8	\$6.8	\$6.8	\$95.8
Total monetized cost	\$174.6	\$176.9	\$179.2	\$206.2	\$1,973.8						
Present value in 2017 (7% discount rate)	\$152.5	\$144.4	\$136.7	\$147.0	\$137.4	\$128.4	\$120.0	\$112.1	\$104.8	\$97.9	\$1,281.3
Present value in 2017 (3% discount rate)	\$164.6	\$161.9	\$159.2	\$177.8	\$172.6	\$167.6	\$162.7	\$158.0	\$153.4	\$148.9	\$1,626.9
Annualized cost (7% discount rate)	\$182.4	\$182.4	\$182.4	\$182.4	\$182.4	\$182.4	\$182.4	\$182.4	\$182.4	\$182.4	\$182.4
Annualized cost (3% discount rate)	\$190.7	\$190.7	\$190.7	\$190.7	\$190.7	\$190.7	\$190.7	\$190.7	\$190.7	\$190.7	\$190.7

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