

BROWSER ENHANCER DETECTION BY EMPLOYERS AND INSURANCE COMPANIES

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INTRODUCTION

As people peruse the Internet, they leave behind a device fingerprint

that can reveal their confidential information.¹ This device fingerprint may include a user's personal information, such as a disability or use of an ovulation tracker.

The question presented in this paper is whether an employer or an insurance company could determine that the user has a disability based on the browser enhancers installed on his browser, and thus discriminate against him. Furthermore, this paper will explore how discrimination using browser enhancers is different—technically, legally, morally, or otherwise—than existing forms of discrimination in the analog world. If discrimination using browser enhancers is possible, are new remedies needed to prevent this discrimination or does the existing framework adequately address these new developments?

Today, many employers are requiring applicants to apply for jobs online.² Additionally, many insurance companies allow interaction between the insured and the insurer online rather than by mail or phone.³ Therefore, it is very possible for employers and insurance companies to connect a user's browser enhancers with a specific user. Thus, new remedies are needed to prevent discrimination based on browser enhancer detection because the existing framework does not adequately address these new developments.

When a user visits a website, he allows that website to access a lot of critical information about his computer's configuration.⁴ For example, look at Amazon's privacy policy, "Examples of the information we collect and analyze include the Internet protocol (IP) address used to connect your computer to the Internet; login; e-mail address; password; computer and connection information such as browser type, version, and time zone setting, browser plug-in types and versions, operating system, and platform; . . ."⁵ The website asks for this information to ensure that the content it sends to user's computer is properly formatted. The website can determine the user's web user agent, which ranges from web browsers to screen readers and Braille browsers for people with disabilities. In the HTTP protocol, the User-Agent header field typically transmits a characteristic identification string to the website's server that

1. *What Fingerprints Does Your Browser Leave Behind as You Surf the Web?*, PANOPTICCLICK, <http://panopticlick.eff.org/about.php> (last visited July 2, 2012).

2. See many, if not all, U.S. defense contractors such as the Boeing Company (on Boeing's website applicants make a full profile to apply: <https://jobs.boeing.com/JobSeeker/ProfileCreate?visited=true&action=add>), Lockheed Martin (<http://www.lockheedmartinjobs.com/index.aspx>), and Northrop Grumman Corporation (<http://careers.northropgrumman.com>).

3. UNITED HEALTHCARE, <http://www.uhc.com> (last visited Dec. 1, 2010).

4. PANOPTICCLICK, *supra* note 1.

5. *Amazon.com Privacy Notice*, AMAZON, http://www.amazon.com/gp/help/customer/display.html/ref=footer_privacy?ie=UTF8&nodeId=468496 (last updated Apr. 6, 2012).

identifies its application type, operating system, software vender, and software version.⁶ The website server can also ask the user's device for its screen size and color depth, system fonts, and whether cookies are enabled.⁷ Additionally, the browser transmits to the website server its HTTP accept headers. The accept header tells the website server what type of content the browser accepts.⁸ Websites can also query the user's browser for a list of installed plug-ins.⁹ Furthermore, the website can ask the user's computer for its installed add-ons, extensions, and apps.¹⁰ I use the term "browser enhancer" to refer to browser add-ons,¹¹ plug-ins,¹² extensions,¹³ and apps.¹⁴ Knowing the browser enhancers allows the website to reconfigure itself properly on the user's browser. A website can identify a user by assimilating all of the aforementioned information into a device fingerprint.¹⁵ The word "device" refers to computer clients, e.g., personal computers, laptops, smart phones, iPods, iPads, tablets, e-readers, and the like.

6. *User Agent*, WIKIPEDIA, http://en.wikipedia.org/wiki/User_agent (last visited Nov. 28, 2011).

7. PANOPTICCLICK, *supra* note 1.

8. PANOPTICCLICK, *supra* note 1.

9. To see just how much information your browser reveals, go to <http://browserspy.dk> or <http://panopticklick.eff.org>.

10. PANOPTICCLICK, *supra* note 1. See also Gregory Fleischer, *Enumerate Firefox Addons*, PSEUDO-FLAW.NET (2009), <http://pseudo-flaw.net/tor/torbutton/enumerate-firefox-addons.html> ("Some Mozilla Firefox addons define their own XPCOM interfaces. These interface are registered internally within Firefox. By enumerating these interfaces and testing for their existence, it is possible to determine if the addon is installed and enabled."); Gregory Fleischer, *Attacking Tor at the Application Layer – Online Demonstrations*, PSEUDO-FLAW.NET (2010), <http://pseudo-flaw.net/content/defcon/dc-17-demos> (describing more browser detection demos).

11. An "add-on" is a piece of software that enhances the capabilities of a larger software application, such as a web browser. Add-on is sometimes used generally to refer to add-ons, plug-ins, and extensions. *Add-on*, WIKIPEDIA, <http://en.wikipedia.org/wiki/Add-on> (last visited Feb. 16, 2011).

12. A "plug-in" is a set of software components that adds specific capabilities to a larger software application. Browser plug-ins enable the web browser to play video, scan for viruses, and display new file types. Common plug-ins are Adobe Flash Player, Adobe Acrobat, Google Earth, and Quick Time. *Plug-In*, WIKIPEDIA, http://en.wikipedia.org/wiki/Plug-in_computing (last visited Feb. 16, 2011).

13. The word browser "extension" is commonly used interchangeably with add-on and plug-in. However, the term really depends on the browser, e.g., Firefox and Chrome use extensions. Extensions modify the behavior of existing features or add entirely new features to the browser application. Examples of extensions include RSS readers, bookmark organizers, toolbars, e-mail, and developer tools. Greasemonkey is a Firefox extension that modifies how the user views web pages; it allows the user to customize the way a webpage displays. *Browser Extension*, WIKIPEDIA, http://en.wikipedia.org/wiki/Browser_extension (last visited Dec. 1, 2010).

14. "Apps" are used in Google's Chrome browser and are similar to add-ons, but with some differences.

15. A device fingerprint, or digital fingerprint, is a summary of the assimilation of the software and hardware settings collected from a remote computing device.

Additionally, many people believe that discrimination in the workplace rarely occurs; however, people with disabilities are often the subject of discrimination.¹⁶ One company is now offering advanced brain function testing to screen new and existing personnel for cognitive deficits, depression, impaired attention, and poor vigilance.¹⁷

This paper proceeds in four parts. Part I first explains the current technology that could enable website owners to discriminate against Internet users solely based on the users' installed browser enhancers. Next, Part I reviews the possible threats from the aforementioned privacy concerns and the harms from these threats. Part II first gives background information on Americans with disabilities and the Americans with Disabilities Act ("ADA"). Next, Part II continues with the current legal framework under the ADA and how it may be inadequate to protect consumers against discrimination based on the user's installed browser enhancers. Part III considers possible technical solutions to the browser enhancer detection problem, whether browser enhancer detection is legal, whether there are legal solutions to browser enhancer detection, and whether this type of consumer harm falls within the March 2012, Federal Trade Commission Report on Protecting Consumer Privacy.¹⁸ Lastly, the final section, Part IV, applies the browser enhancer detection threat to other areas of discrimination beyond disabilities.

16. See MARK C. WEBER, DISABILITY HARASSMENT 1-25 (2007); *EEOC Press Releases*, U.S. EQUAL EMP'T OPPORTUNITY COMM'N, <http://www.eeoc.gov/eeoc/newsroom/release> (last visited July 2, 2012); Penni P. Bradshaw, *Disability Discrimination Under the Americans with Disabilities Act*, 20 AM. JUR. 3D *Proof of Facts* 361 (1993).

17. COGNITIVE PERFORMANCE TESTING SERVICES, <http://cognitivetestingservices.com> (last visited Aug. 13, 2012). The test measures attention, impulsivity and reaction time, checks for impairment in sustaining attention, and provides an evaluation of short term and long-term memory, motor coordination, executive functions, errors of commission, and errors of omission. The website boasts:

About twenty percent of the population suffers from clinical neuropsychiatric disorders such as Attention Deficit Disorder, learning disorders, and depression. Many more are functionally compromised by less severe symptoms of those conditions or by an inability to effectively handle stress. On the surface these individuals are difficult to identify as they may score highly on academic and I.Q. tests and be high functioning under some conditions. However, such individuals can pose a liability to your company since they may be effective in specific areas but limited and impaired in others.

18. FED. TRADE COMM'N, PROTECTING CONSUMER PRIVACY IN AN ERA OF RAPID CHANGE: RECOMMENDATIONS FOR BUSINESSES AND POLICYMAKERS (Mar. 2012), available at <http://www.ftc.gov/os/2012/03/120326privacyreport.pdf> (hereinafter FTC PRIVACY REPORT).

I. THE CURRENT TECHNOLOGY AND DETECTION

A. Current Technology

When a device user visits a website, the user allows that website's server to access a lot of information about his device's configuration. Examples of configuration information that is transmitted to the server include the User-Agent header that may identify the web browser, screen reader, Braille browser, software vender, and software version; the device's screen size and color depth; system fonts; whether cookies are enabled; HTTP accept headers; and the installed browser enhancers.¹⁹ The website's server asks for all of this information in order to provide properly formatted content to the user's device.

A device fingerprint, or machine fingerprint, is a summary of the assimilation of the software and hardware settings collected from a remote computing device.²⁰ Device fingerprints are created in part by looking at the user's installed browser enhancers.

1. Add-ons, Plug-ins, Extensions, and Apps

"Add-on" is the more general term for a piece of software that enhances the existing capabilities of or provides additional functions to a core software application, such as a web browser.²¹ Add-ons typically cannot be run independently. The word "add-on" is often used to include snap-ins, plug-ins, extensions, and themes.²² Mozilla's applications, such as Firefox, use add-ons to enhance the applications.

A "plug-in" is a set of software components that adds specific capabilities to a larger software application such as the browser.²³ Plug-ins allow users to customize the functionality of the browser application.²⁴ Websites query the user's browser for a list of browser enhancers in order to configure the webpage properly based on the user's browser configuration. Browser plug-ins enable the web browser to play video, scan for viruses, and display new file types.²⁵ Email clients use plug-ins to decrypt and encrypt email (Pretty Good Privacy).²⁶ Common plug-ins are Adobe Flash Player, Adobe Acrobat, Google Earth, and Quick Time.

Plug-ins are slightly different from extensions, which modify the

19. PANOPTICCLICK, *supra* note 1.

20. *Id.*

21. *Add-on*, *supra* note 12.

22. *Plug-In*, *supra* note 13.

23. *Id.*

24. *Check Your Plug-ins*, MOZILLA, <http://www.mozilla.org/en-US/plugincheck/> (last visited Aug. 12, 2012).

25. *Plug-in*, *supra* note 12.

26. *Check Your Plug-ins*, *supra* note 24.

behavior of existing features or add entirely new features and functionality.²⁷ Plug-ins usually have a narrow set of abilities.²⁸ However, the word browser “extension” is often used interchangeably with “add-on” and “plug-in.” The correct term really depends on the browser, e.g., Firefox, Chrome, and Internet Explorer (version 5 and newer) use extensions.²⁹ Examples of extensions include RSS readers, bookmark organizers, toolbars, e-mail, and developer tools.³⁰ Extensions that modify how the user views web pages include Adblock (prevents the browser from loading advertisement images) and Greasemonkey (Firefox extension that allows the user to customize the way a webpage displays).

“App,” which is short for “web based application,” is an application (software package) that is accessed over a network such as the Internet or an intranet.³¹ The software and database reside on central server rather than being installed on the device.³² The term “web based application” also refers to a computer software application that is hosted in a browser-controlled environment or is written in a browser-supported language, such as JavaScript combined with HTML.³³ Google’s Chrome browser uses apps, which are programs that are designed to be used entirely within Chrome.³⁴ Apps allow users to create documents, edit photos, and listen to music without installing heavy software on to their devices.³⁵ Gmail, Google Maps, Google Docs, and Google Books are examples of apps.³⁶ Apps can also work offline if the user creates a packaged app, i.e., a downloaded web app.³⁷ Packaged apps have the option of using the Google Chrome Extension APIs, which allows packaged apps to change the way Chrome looks or behaves.³⁸

2. Accessibility Programs

Accessibility programs are a form of assistive technology; they

27. *Check Your Plug-ins*, *supra* note 4.

28. *Plug-in*, *supra* note 12.

29. *Browser Extension*, *supra* note 13.

30. *Add-on (Mozilla)*, WIKIPEDIA, [http://en.wikipedia.org/wiki/Add-on_\(Mozilla\)](http://en.wikipedia.org/wiki/Add-on_(Mozilla)) (last visited Aug. 12, 2012).

31. *Web Application*, WIKIPEDIA, http://en.wikipedia.org/wiki/Web_application (last visited Aug. 12, 2012).

32. *Web Based Application*, NETSITY, <http://www.netsity.com/webbasedapplication.htm> (last visited Aug. 12, 2012).

33. *Web Application*, *supra* note 31.

34. *Tabs and Windows: What are Apps?*, GOOGLE CHROME HELP, <http://www.google.com/support/chrome/bin/answer.py?answer=1050586> (last visited Aug. 12, 2012).

35. *Id.*

36. *Id.*

37. *Installable Web Apps*, GOOGLE DEVELOPERS, <http://developers.google.com/chrome/apps/> (last visited Aug. 12, 2012).

38. *Id.*

allow people with disabilities to access information and perform tasks that people without disabilities can easily access and perform.³⁹ This paper focuses on accessibility programs in the form of computer software that allow the user to access information he would otherwise be unable to access because of his mental or physical impairment. Most accessibility programs discussed in this paper allow access to Internet content and either run as browser enhancers or as stand-alone programs. Examples of accessibility programs include screen readers and text-to-speech software; computer programs designed for people with learning disabilities, dyslexia, or autism, such as Read&Write Gold and Lexiflow; and MAGpie for people with hearing impairments.⁴⁰

a. Browser Enhancers or Stand-Alone Programs?

Current accessibility programs work in different ways and take different forms. Some accessibility programs are browser enhancers, which are usually started on demand by the browser itself. Other accessibility programs are stand-alone programs that are started by the user through the device's operating system. The stand-alone programs can work with the Internet, but from a technical point of view they operate differently than browser enhancers.

According the University of Colorado Disability Services in November 2010, many disabled students at CU use stand-alone accessibility programs that run on the device operating system rather than browser enhancers that run on the user's web browser.⁴¹ However, in October 2011, Texthelp—the worldwide leader in providing literacy software solutions and the makers of the popular assistive software Read&Write GOLD⁴²—announced that many of its products are now

39. *Computer Access*, TRACE <http://trace.wisc.edu/computer/> (last visited Aug. 12, 2012).

40. The following websites can help you choose an assistive technology that is right for you:

- AOTA (American Occupational Therapy Association)
- ASHA (American Speech-Language-Hearing Association)
- CEC (Council for Exceptional Children)
- LDA (Learning Disability Association of America)
- RESNA (Rehabilitation and Engineering Society of North America)

Additionally, ATIA members provide assistive technology in various fields: autism spectrum disorders, blindness and low vision, deafness and hard of hearing, computer access, communication disorders, mobility impairment, mounting systems, learning disabilities, cognitive disabilities, web accessibility, augmentative and alternative communication devices (AAC). ASSISTIVE TECHNOLOGY INDUSTRY ASSOCIATION, <http://www.atia.org> (last visited Aug. 1, 2012).

41. Call with Cath Stager-Kilcommons, Assistive Technology Lab Coordinator University of Colorado at Boulder Disability Services (Nov. 30, 2010).

42. *Welcome to Texthelp Systems*, TEXTHELP, <http://www.texthelp.com> (last visited Aug. 12, 2012). Examples of Texthelp programs (quoted from the website):

- Read&Write GOLD, our award-winning software product, is designed to assist

available as Web Apps that work within web browsers (Internet Explorer, Safari, Chrome, and Firefox) on PCs, Macs, iPads, iPhones, iPod Touches, and other mobile devices.⁴³

These stand-alone accessibility programs and associated web apps are often very expensive, but are offered to University of Colorado students free-of-charge if the student can prove that he or she has a disability. For many other Americans with disabilities, the cost of such programs can be prohibitive.⁴⁴ Therefore, people use free-of-charge or low-cost browser enhancers and other open source programs instead of the expensive programs.

For the purposes of this paper, I assume that all current accessibility computer programs can and will be available in the form of browser enhancers in the future. As mentioned above, Read&Write GOLD is currently available as both a computer program and a browser enhancer.⁴⁵ Technically, this assumption is not a stretch considering the increasing use of the Internet and cloud-based programs.⁴⁶ Furthermore, the Universal Design approach is compatible with browser enhancers and cloud-based programs.⁴⁷

students and individuals of all ages who require extra assistance when reading or composing text.

- Fluency Tutor, our latest product, is an online software solution designed to assess and improve pupils' reading and comprehension levels.
- Lexiflow is a secure, high quality solution for creating accessible Adobe Flash talking eBooks and assessments for students who require read aloud support.
- SpeechStream enhances Publishers' HTML or Flash content by embedding literacy support features to improve student's retention, comprehension, and recall.
- Browsealoud is designed to improve website accessibility for those who struggle to read content online. It works by reading website content aloud in a high quality, human-sounding voice at no cost to the end user and zero implementation for the web owner.

43. *Texthelp Web Apps*, TEXTHELP, <http://apps.texthelp.com> (last visited Aug. 12, 2012). Examples of Texthelp Web Apps include:

- Read&Write Web: The Read&Write Web toolbar interacts with your web content providing text-to-speech and a lot more.
- eBook Reader: The eBook Reader App allows you to read Bookshare® eBooks with dual color highlighting and a lot more.
- Dictionary: The Dictionary App allows you to look up words and get both text definitions and picture images.
- Speech: The Speech App provides text-to-speech functionality for reading aloud with dual color highlighting.

44. Cathy Bodine & WebAIM developers, Presentations at the Coleman Institute Workshop and Conference, Boulder, Colorado and Westminster, Colorado (Oct. 20-21, 2010).

45. *Texthelp Web Apps*, *supra* note 43.

46. Cloud-based programs involve "a software and server framework (usually based on virtualization)" that uses "many servers for a single software-as-a-service style application or to host many such applications on a few servers." PETER MELL & TIM GRANCE, NAT'L INST. OF STDS. & TECH., PERSPECTIVES OF CLOUD COMPUTING AND STANDARDS 3 (2008), available at http://csrc.nist.gov/groups/SMA/ispab/documents/minutes/2008-12/cloud-computing-standards_ISPAB-Dec2008_P-Mell.pdf.

47. *Universal Design*, WIKIPEDIA, http://en.wikipedia.org/wiki/Universal_design (last

b. Browser Enhancers Commonly Used by People with Disabilities

Below is a list of browser enhancers that are commonly used by people with disabilities.

- The Browsealoud Plug-In (text to speech)
<http://www.house.gov/house/browsealoud.shtml>; and
http://www/browsealoud.com/page.asp?pg_id=80094&tile=USA
- Chrome Daltonize! (exposing details to color-blind users)
<https://chrome.google.com/extensions/detail/efeladnkafmoofnba gdbfaieabmejfcf>
- PlainClothes (unstyles websites, removes color and simplifies the website)
<https://chrome.google.com/extensions/detail/kleiknekfnnaaibjhla midabhmckbddd>
- Readability Redux (removes clutter on webpages)
<https://chrome.google.com/extensions/detail/jggheggpdocamnea acmfoipeehedigia>
- colorXtractor (written for people with color-blindness, helps color blind people distinguish colors) <https://addons.mozilla.org/en-US/firefox/search/?q=color+blind&cat=1,73&lver=any&pid=1&sort=&pp=20&lup=&advanced=>
- DDRReader (Dorina Daisy Reader application is a DAISY 3.0 digital book reader that functions as a Firefox add-on)
<https://addons.mozilla.org/en-US/firefox/addon/9276>
- FoxVox (screen reader for Firefox) <https://addons.mozilla.org/en-US/firefox/addon/9759>
- MozBraille (extension to transform Mozilla or Firefox to a stand alone accessible Internet browser designed for blind or partially sighted users so that users do not need a third party program like a screenreader) <http://mozbraille.mozdev.org>

3. Identifying Technology Derived from Protective Technology

The same device fingerprinting technology can be used to help and harm the user.

a. The Original Protective Technology

Device fingerprints were first developed in the early 1990s to

combat identity theft and fraud.⁴⁸ In 2009, Javelin Research reported that identity fraud costs about \$54 billion per year in the United States alone.⁴⁹ Therefore various types of protection software, such as the 41st Parameter's software, have emerged over the years. The 41st Parameter's patented TimeDiff Linking technology creates a real-time digital fingerprint of the user's device.⁵⁰ This device fingerprint can then be saved by the user's bank and every time the user logs into his online banking system the bank's program using TimeDiff Linking technology will compare the saved device fingerprint to the real-time device fingerprint of the device trying to access the banking information.⁵¹ If the two device fingerprints do not match, then the bank will ask for additional proof of the user's identity before allowing access to the user's banking information.⁵² The device fingerprinting technology protects the user because if a hacker tries to access the user's account, the bank will know the hacker is attempting to access information from a device other than the user's normal device and that the hacker is located in a different location than the user's normal location.⁵³ Furthermore, the technology can quickly pinpoint repeat hackers to build a stronger defense against the specific behaviors exhibited by cybercriminals.⁵⁴

Additionally, Scout Analytics launched a service to reduce password sharing for exclusive publishing services.⁵⁵ Scout Analytics's service combines browser fingerprinting with a unique biometric based on a user's typing pattern.⁵⁶ The biometric is used to distinguish an authorized user from an unauthorized friend or family member.⁵⁷

b. Transformation to Identifying Disabilities

The information contained in a device fingerprint about a device's

48. Julia Angwin & Jennifer Valentino-DeVries, *What They Know: Race Is On to 'Fingerprint' Phones, PCs*, WALL ST. J., DEC. 1, 2010, at 1, available at <http://online.wsj.com/article/SB10001424052748704679204575646704100959546.html>.

49. George Lawton, *Browser Fingerprints Threaten Privacy*, COMPUTING NOW (Apr. 2010), <http://www.computer.org/portal/web/computingnow/archive/news057>.

50. *The 41st Parameter Extends U.S. Patent on Improved TimeDiff Linking Technology to Detect and Prevent Phishing Transparently to Bank Customers*, 41ST PARAMETER (June 29, 2005), http://www.the41.com/docs_article.asp?articleid=4.

51. *Id.*

52. Facebook uses similar technology to notify a user that her account has been accessed by an unknown device, if the user has her Facebook security settings set in this way. *Privacy Settings*, FACEBOOK, <https://www.facebook.com/settings/?tab=privacy> (last visited July 28, 2012).

53. The user's bank knows the user's normal location based on the user's IP address.

54. 41ST PARAMETER, *supra* note 50.

55. Lawton, *supra* note 49.

56. Browser fingerprinting is the same concept as device fingerprinting, but the fingerprint is created entirely from the user's browser's settings.

57. Lawton, *supra* note 49.

configuration is commonly transmitted to a website's server to ensure that the server provides the user with properly formatted content. According to current U.S. and EU privacy laws, the information collected for a device fingerprint, including a list of the user's browser enhancers, is legal.⁵⁸

However, all of this legally collected information may be used for other identification purposes. Advertising companies continue to reach further and further into identifying computer users for directed advertisements.⁵⁹ Because the device configuration information is commonly transmitted, easily collected, and legally collectable, it is not hard to imagine savvy employers and insurance companies collecting and saving a user's configuration information. There are many parts of the device configuration information that an employer or insurance company may be interested in collecting: the User-Agent, installed fonts, and browser enhancers.⁶⁰ The User-Agent can tell the employer or insurance company whether the user is using an uncommon browser, perhaps one specifically designed for the user's disability. The user's fonts show whether the user has Braille or some other disability-identifying font installed. And lastly, the browser enhancers are probably the most telling of the user's condition because many browser enhancers are developed specifically for the user's condition. Browser enhancers range in purpose from enabling a blind person to listen to the spoken words of a website, removing a website's clutter, reminding a person to take his medicine and go to his doctor appointment, preventing flashing videos so a person with photosensitive epilepsy does not have a seizure, to tracking when a woman hoping to become pregnant is ovulating.⁶¹

Just because the user utilizes an accessibility program that is not a browser enhancer does not mean that the website owner (e.g., an employer or insurance company) cannot detect the use of an accessibility

58. Paul Ohm, *Broken Promises of Privacy: Responding to the Surprising Failure of Anonymization*, 57 UCLA L. REV. 1701, 1734-35 (2010), available at <http://uclalawreview.org/?p=1353> ("In addition to HIPAA and the EU Data Protection Directive, almost every single privacy statute and regulation ever written in the U.S. and EU embraces—implicitly or explicitly, pervasively or only incidentally—the assumption that anonymization protects privacy.").

59. See Edward Wyatt & Tanzina Vega, *F.T.C. Backs Plan to Honor Privacy of Online Users*, N.Y. Times, Dec. 2, 2010, at A1; Angwin & Valentino-DeVries, *supra* note 48.

60. *Enumerate Firefox Addons*, *supra* note 10 ("Some Mozilla Firefox addons define their own XPCOM interfaces. These interface are registered internally within Firefox. By enumerating these interfaces and testing for their existence, it is possible to determine if the addon is installed and enabled."); Gregory Fleischer, *Attacking Tor at the Application Layer – Slides*, Presentation at DEFCON 17 (2009), <http://pseudo-flaw.net/content/defcon>. See also *Attacking Tor at the Application Layer*, *supra* note 10.

61. Translate this discrimination to any class of people. For example, a woman may download an add-on to track her ovulation because she would like to become pregnant. See Section IV.A for more on this type of discrimination.

program. There are other ways in which a website owner could discover that the user has an accessibility program installed. First, if the accessibility program runs in the cloud, then usually the user's computer first accesses the program's server and then the program server requests the desired website. Often, when the program runs in the cloud, the IP address requesting the desired website is linked to the program's server and not the user's computer. Here, the website owner can look at the user's IP address and discover that it is assigned to the accessibility program server. Additionally, UDL Editions by CAST claims that to allow a cloud-based screen reader to work with Internet content, the screen reader must get permission from owners of online content.⁶² Therefore, the website must know that the user is using a cloud-based screen reader in order to allow access to the website content.⁶³

Second, by using ActionScript the website can detect whether the user is using a screen reader that runs on the device's operating system in addition to screen readers that run within the web browser.⁶⁴ The `Accessibility.isActive()` function will return "true" if a MSAA supported screen reader capable of accessing Flash content is detected through the user's browser.⁶⁵ Some people argue that it is best if the server knows that the user has a screen reader installed because then the website server can send the user text in the place of pictures and video to ensure the screen reader can read the content in the picture or video.⁶⁶ This technique can benefit the user by allowing him to access information in the picture or video that he would otherwise be unable to access with a screen reader alone.⁶⁷

Third, as previously mentioned, the user's browser will transmit its User-Agent header to the website's server, which identifies the browser type. If the disabled person is using a web browser that is specifically designed for people with his specific disability, then the website owner will see he is using a specialized web browser. One example of a specialized browser is Zac Browser, which is designed "specifically for children living with variants of autism spectrum disorders (ASD),

62. The truth of this statement is beyond the scope of this paper. See Presentation by CAST employee at the Silicon Flatirons Center and Coleman Institute Workshop on Cloud Computing for People with Cognitive Disabilities, Boulder, Colorado (Oct. 20, 2010).

63. *Id.*

64. *Creating Accessible Flash Content*, WEBAIM, <http://webaim.org/techniques/flash/techniques> (last visited Aug. 13, 2012).

65. As of 2011, the only screen readers capable of accessing Flash content are the up-to-date versions of Window-Eyes, JAWS, and IBM Home Page Reader. *Id.* This function did not detect that my Macbook Pro computer had Voice Over enabled (tested on Nov. 29, 2010). To see if this function detects your screen reader, go to the following site: <http://webaim.org/techniques/flash/media/detect.html> (last visited Dec. 1, 2010).

66. *Creating Accessible Flash Content*, *supra* note 64.

67. *Creating Accessible Flash Content*, *supra* note 64.

Asperger syndrome, Rett syndrome, childhood disintegrative disorder, PDD not otherwise specified and PDD-NOS, also called atypical autism.”⁶⁸ Another example of a specialized browser is HearSay.⁶⁹ HearSay is a non-visual web browser designed for people with vision impairments, “featuring context-directed browsing, a unique and innovative Web accessibility feature, and an extensible VoiceXML dialog interface.”⁷⁰

Lastly, if the user has the Braille font installed, then the website owner will see Braille listed as an installed font. Because none of these four methods of detecting accessibility programs involve browser enhancer detection, they are beyond the scope of this paper.

There are very few reasons for a computer user to use a special browser, Braille, or a screen reader unless the user, or someone with whom the user shares a computer, has a need for one of these tools. According to Cath Stager-Kilcommons at the University of Colorado Disabilities Services, in 2010 approximately 95% of WYNN, Window Eyes, and Read&Write Gold users have some form of a disability and about 75% of FoxVox and FireEyes users have a disability.⁷¹ Accordingly, these percentages show that if a user has one of these accessibility programs installed, then the majority of the time the user has a disability. Furthermore, most of these accessibility programs are marketed to people with disabilities. Therefore, people without disabilities are less likely to know about the available accessibility programs unless they are looking for information on such programs or they are software developers developing the accessibility programs. Accordingly, few people without disabilities, with the exception of software developers, will have these programs installed because they do not know that these programs exist.

c. *The Panopticlick Experiment*

By visiting a website, the user allows the website to access information about the user’s device’s configuration,⁷² such as the fonts installed on the computer, the browser enhancers installed on the browser, the operating system, and the browser type and version. When this information is combined, it can create a fingerprint-like identifier for

68. ZAC BROWSER, <http://www.zacbrowsers.com> (last visited Nov. 30, 2010).

69. *HearSay3: A Vision for the Blind*, HEARSAY, <http://www.cs.sunysb.edu/~hearsay> (last visited Apr. 30, 2011).

70. Yevgen Borodin et al., *The HearSay Non-Visual Web Browser*, PROCEEDINGS OF THE 2007 INT’L CROSS-DISCIPLINARY CONF. ON WEB ACCESSIBILITY (W4A) 128, 128 (2007), available at <http://portal.acm.org/citation.cfm?id=1243444>.

71. Stager-Kilcommons, *supra* note 41.

72. PANOPTICCLICK, *supra* note 1.

the user's device.⁷³ The Electronic Frontier Foundation (EFF) is conducting an experiment to see how unique different computers' configurations really are.⁷⁴ The EFF logs users' configuration and version information from their operation system, browser, and plug-ins. Then the EFF compares this information to other users' configurations.⁷⁵

The EFF Panopticlick experiment found that, within its sample, 94.2% of browsers with Flash or Java Virtual Machine enabled were unique.⁷⁶ Furthermore, the experiment lists all fonts and browser enhancers detected on the user's device. This detection technology is rather simple and has been around for at least a decade, see Section I.3.A.

B. Threats: The Likelihood of Detection

Many people with disabilities do not want their employers or insurance companies to know that they have a disability because of fear of discrimination. Obviously, it is not always possible to conceal a disability if the disability is visibly apparent or if the person requires assistive technology to perform daily activities, including job-related requirements and responsibilities. However, if the disability can be hidden, an individual may elect to maintain privacy in order to prevent discrimination and harassment. History is littered with terrible stories of discrimination and harassment against people with disabilities.⁷⁷ The cases range from failing to give a factory assembly line employee a reasonable accommodation for her carpal tunnel syndrome⁷⁸ to an electrician who was offered a job, but the offer was later deferred after his muscular dystrophy was discovered in a post-offer/pre-employment physical, even though the electrician had adapted how he performed manual tasks and, therefore, was able to perform his job requirements.⁷⁹ In another case, an individual was fired because of his clinical depression.⁸⁰ One man with epilepsy took medicine to reduce the frequency and severity of his seizures since he was five years old.⁸¹ He

73. *Id.*

74. The EFF published a report on the Panopticlick experiment results, though it continues to conduct its experiment, Peter Eckersley, *How Unique is Your Web Browser?* ELEC. FRONTIER FOUND., (May 17, 2010), available at <https://panopticlick.eff.org>. See also PANOPTICCLICK, *supra* note 1.

75. PANOPTICCLICK, *supra* note 1.

76. Eckersley, *supra* note 74.

77. *White v. Clark County Sch. Dist.*, 197 F.3d 1271, 1272-73 (9th Cir. 1999). See also PHILIP BOURGOIS, IN SEARCH OF RESPECT: SELLING CRACK IN EL BARRIO 188-89 (2d ed. 2003).

78. *Toyota Motor Mfg., Ky., Inc. v. Williams*, 534 U.S. 184 (2002).

79. *McClure v. General Motors Corp.*, 75 F. App'x 983 (5th Cir. 2003).

80. *McMullin v. Ashcroft*, 337 F. Supp. 2d 1281 (D. Wyo. 2004).

81. *Todd v. Academy Corp.*, 57 F. Supp. 2d 448, 449-50 (S.D. Tex. 1999).

was fired after having eight “light” seizures at work even though these seizures were only five to fifteen seconds long and the man was able to recognize the onset of one of these “light” seizures and lie down in a separate location to prevent harm to himself or others.⁸²

One author recounts a conversation between two drug dealers he befriended. The author asked the dealers about their education, and one replied:

We used to come to school to fuck Special Ed niggas up – kick their asses. Because they had the retarded here, and the ones that used to walk like this [scraping his toes, inflicting his knees, and pronating his arms to imitate someone with cerebral palsy]. We used to beat the shit out of them. We used to hurt them, because we didn’t like them.⁸³

Because of discrimination and harassment, Debra Angel MacDougall advises job seekers with less obvious physical and mental impairments to use the “make them love you first” approach.⁸⁴ She recommends keeping quiet about the impairment, such as a vision problem that requires the use of a special computer screen or a bad back that makes it impossible to sit through long meetings without getting up, until the applicant gets the job offer.⁸⁵ MacDougall recommends telling the employer about the challenge before accepting the position, but after the employer already likes the applicant.⁸⁶ Hiring managers are always weighing the benefits and risks of new employees; therefore, an applicant wants to convince his potential employer that he has a surplus of benefits before revealing his risks.⁸⁷

1. Can an Employer or Insurance Company Detect Browser Enhancers?

Yes, employers and insurance companies can detect browser enhancers; it is not difficult to do and the technology already exists. However, the real question, which is discussed later, is: how likely and how feasible is it that employers and insurance companies are using the information contained in a user’s installed browser enhancers?

The detection problem may arise if an employer, a potential

82. *Id.*

83. BOURGOIS, *supra* note 77, at 188-89.

84. Susan Adams, *Get Hired Despite Red Flags in Your Story*, FORBES (Oct. 7, 2010, 6:20PM), <http://www.forbes.com/2010/10/07/hiring-criminal-record-disability-leadership-careers-employment.html>.

85. *Id.*

86. *Id.*

87. *Id.*

employer, or an insurance company requires the employee, applicant, or customer to perform some task on the company's website because websites automatically ask for information about the user's device and configuration (see Section I.A.3, *infra*). The required online task could be applying for a job, applying for health insurance, filing a health insurance claim, filing a car insurance claim, or downloading information from the employer's website.

However, mere knowledge of the user's installed browser enhancers and device configuration is not problematic until this information is linked with the particular user's name or identity. Therefore, the threat of detection arises when the company requires the user to log onto the company's website because now the website knows the identity of the user. Further, if the website server documents and saves the user's device configuration information, including the user's installed browser enhancers, and then associates this information with the user's identity, the company that controls that website now knows the device configuration for that specific person.

Through this detection process the employer or insurance company may discover that the user, who may be an employee, applicant, or customer, has a browser enhancer that is predominantly used by people with disabilities. Based on the knowledge of the installed disability browser enhancer, the company may take negative action toward the user. If a potential employer learns that the applicant has a disability-specific browser enhancer installed on the his device by looking at the applicant's device configuration, and the potential employer assumes the applicant has a disability, then the potential employer may refuse to hire the applicant based on this assumption that the applicant has a disability. If the employee is currently working for the employer and the employer learns of the employee's disability-specific browser enhancer, then the employer could discriminate against or harass the employee after assuming the employee has a disability. Additionally, an insurance company may refuse to cover an applicant with a disability or may charge the applicant a much higher premium after learning of the applicant's disability-specific browser enhancer and making the assumption that the applicant has a disability.

As you can see, the detection of browser enhancers and device configuration is relatively easy for a website owner to do. Even more problematic, however, is the ease with which such information may be associated with particular users.

2. Pre-Employment Discovery of a Disability Browser Enhancer

Imagine Jimmy. Jimmy has a vision impairment. Jimmy uses a web browser screen reader called FoxVox.⁸⁸ FoxVox is a browser extension for the Firefox web browser.⁸⁹ Jimmy wants to apply for a paralegal position at Company D. Company D requires all application materials (resume, cover letter, references, etc.) be submitted online through its website; therefore, Company D receives Jimmy's application materials through its website. The website, just as other websites do, asks Jimmy's device about its configuration. Then the website saves Jimmy's device configuration with his application materials. Company D's hiring manager prints Jimmy's resume, cover letter, references, and his device configuration information, which includes a list of the browser enhancers installed on Jimmy's device. Company D's hiring manager sees FoxVox listed as one of Jimmy's browser enhancers. After a quick Google search, the hiring manager discovers that FoxVox is a screen reader marketed for people with vision impairments.

The hiring manager knows that the paralegal position requires a significant amount of reading and worries that Jimmy will not be able to perform all of the necessary duties as quickly and as efficiently as a person without a vision impairment. The hiring manager decides he does not want to waste his time asking whether Jimmy actually has a vision impairment because he has 100 other applications to review. Therefore, Jimmy does not get an interview with Company D and, thus, does not get the job.

a. Why Would a Potential Employer Care About Browser Enhancers?

There are many reasons why a potential employer may care about the browser enhancers installed on an applicant's device. First, the applicant's browser enhancers can reveal personal information about the applicant without forcing the employer to ask the applicant about this information during an interview. The potential employer could learn that the applicant has a vision impairment, has a hearing impairment, has a cognitive disability, is color blind, has another particular disability, or that the applicant is trying to conceive a child, all without asking a question pertaining to this information.

88. *FoxVox: Add-ons*, MOZILLA FIREFOX, <https://addons.mozilla.org/en-US/firefox/addon/9759> (last visited Aug. 13, 2012). There are other plug-in screen readers, such as the popular *Browsealoud*. *Browsealoud*, *Texthelp*, http://www.browsealoud.com/page.asp?pg_id=80094&tile=USA (last visited Aug. 13, 2012).

89. *FoxVox: Add-ons*, MOZILLA FIREFOX, <https://addons.mozilla.org/en-US/firefox/addon/9759> (last visited Aug. 13, 2012).

Second, it is illegal to discriminate against an employee based on race, gender, age, or sexual orientation.⁹⁰ It is also illegal to discriminate against an applicant because the applicant has a disability, unless the disability would prevent the employee from performing required job duties with a reasonable accommodation.⁹¹ Although the majority of accommodations are inexpensive, many employers believe that accommodations are expensive and burdensome.⁹²

If the employer does not hire the applicant after asking whether the applicant has a disability, then the applicant has better grounds for a discrimination lawsuit because there is evidence that the employer may have considered the applicant's disability for hiring purposes. Therefore, if an employer does not ask an employee about his disability and chooses not to interview an applicant, there is a lower likelihood of the employer getting caught for discrimination. In the current job market, many employers receive applications that greatly outnumber the actual positions available.⁹³ Accordingly, employers turn away many more applicants before the applicants even walk through the door for an interview because employers simply do not have time to interview all applicants.

Third, hiring and firing an employee is an expensive process.⁹⁴ The employer must spend time finding the best applicant, training the new employee, and paying the employee. If the employer wants to fire an employee, he must do so for a legal reason or no reason at all, but he cannot fire an employee for a reason linked to discrimination.⁹⁵ Because it is expensive to hire and fire an employee, many employers want to

90. The Equal Employment Opportunity Commission is an independent federal law enforcement agency that enforces laws against workplace discrimination. It was established on July 2, 1965. Its mandate is specified under Title VII of the Civil Rights Act of 1964, the Age Discrimination in Employment Act of 1967 (ADEA), the Rehabilitation Act of 1973, the Americans with Disabilities Act (ADA) of 1990, and the ADA Amendments Act of 2008. *EEOC: The Law*, EQUAL EMPLOYMENT OPPORTUNITY COMMISSION, <http://www.eeoc.gov/eeoc/history/35th/thelaw/index.html> (last visited Aug. 13, 2012).

91. Americans with Disabilities Act, 42 U.S.C. §§ 12112(a) & 12112(b)(5) (2012).

92. H. STEPHEN KAYE, 2 DISABILITY WATCH: THE STATUS OF PEOPLE WITH DISABILITIES IN THE UNITED STATES 1, 70-71 (2001), available at http://www.dralegal.org/publications/disability_watch_v2.php (last visited Nov. 28, 2010) (noting that 70% of accommodations cost \$500 or less).

93. See, e.g., *Bureau of Labor Statistics*, U.S. DEP'T OF LABOR, <http://www.bls.gov> (last visited July 28, 2012).

94. Sachin, *The Real Costs of Hiring and Firing – Why Staff Retention is Such a Hot Topic in Employment*, TOP 100 WRITERS (July 23, 2011, 7:46AM), <http://www.ecotarget.com/business-2/employment/the-real-costs-of-hiring-and-firing-why-staff-retention-is-such-a-hot-topic-in-employment>. See generally John M. Abowd & Francis Kramarz, *The Costs of Hiring and Separations*, LABOUR ECONOMICS (Oct. 2003), <https://courses.cit.cornell.edu/jma7/abowd-kramarz-costs-hiring-separation-final.pdf>.

95. CONSTANCE E. BAGLEY & CRAIG E. DAUCHY, *THE ENTREPRENEUR'S GUIDE TO BUSINESS LAW* 303-04 (3d ed. 2008).

ensure that the employee is right for the job before hiring the applicant. The expense of hiring and firing an employee could be an economic incentive to look at the applicant's browser enhancers in hopes of determining whether the applicant has any skeletons in his closet, such as an unannounced disability, before hiring the employee.

Fourth, another possible scenario exists if the employer previously had a bad experience with an employee who had a specific disability. Remember Jimmy? Suppose Company D had a former employee with a vision impairment. The former employee constantly made mistakes because her text-to-speech program was inaccurate. She also refused to wear headphones, and the computerized voice of her text-to-speech program interfered with other employees' work. Additionally, it took her twice as long to complete a task as compared to the other paralegal without a vision impairment. Furthermore, Company D spent thousands of dollars trying different text-to-speech programs in search of the most accurate program. This experience was five years ago, before the text-to-speech programs were as efficient and accurate as they are today. However, Company D's hiring manager has a bad memory of the experience, especially after the employee threatened to sue Company D for unlawful termination based on disability discrimination. Therefore, the hiring manager cares about what browser enhancers applicants have installed because he wants to seek out any applicants with vision impairments before the interview phase.

All of these situations identify examples of why a company may prefer to perform computer-based pre-screening of applicants before interviewing and/or hiring the applicants.

*b. Could a Potential Employer Really Pull Off
Browser Enhancer Detection?*

It is likely that a potential employer could easily collect the applicant's browser enhancers and other device configuration information if the employer requires the applicant to log onto the employer's website, then documents and saves the applicant's device configuration information, including the applicant's installed browser enhancers. Technically, this is not a difficult task because most websites already ask for the user's device configuration information in order to provide properly displayed content to the user.⁹⁶ Therefore, the employer only needs to connect the device configuration to a specific user, which the employer could do if its website requires a user to login, and print out the device configuration information. The employer could perform these steps by buying device-fingerprinting software, hiring one of the device-

96. See Section I.A.3 for more information on the technology.

fingerprinting companies to develop software specifically for the employer, or contracting a computer programmer to develop software that outputs the device configuration information, which is already transmitted by the user's device, into a document or other human readable format for the employer. Considering that many companies, including the non-profit Electronic Frontier Foundation, are already collecting this information, it would not be difficult for an employer to also collect and store this information.⁹⁷

*c. If the Most the Potential Employer Can Learn is X,
is there an Easier Way to Learn X?*

As discussed in Section I.B.2.a, a potential employer can learn whether an applicant may have a disability or other hidden condition if the applicant uses a browser enhancer for his disability or condition.⁹⁸

Accordingly, there are other ways for potential employers to learn whether an applicant may have a disability or other hidden condition. Additionally, it is illegal to discriminate against an applicant based on the applicant's disability, unless the disability would prevent the applicant from performing necessary duties of his job with a reasonable accommodation.⁹⁹

One way employers may identify an applicant's disability is to require the applicant to get a pre-employment medical examination or take a pre-employment brain function test. However, the Americans with Disabilities Act limits an employer's use of qualification standards to screen out individuals with disabilities unless the selection criteria is consistent with business necessity.¹⁰⁰ One company offers advanced brain function testing to screen new and existing personnel for cognitive deficits, depression, impaired attention, and poor vigilance.¹⁰¹ These cognition tests range widely in price, and the question is whether a testing program is more or less expensive than software that documents an applicant's device configuration.¹⁰² The employer would also need to consider what valuable information could be revealed from a cognition test versus what information could be revealed from the applicant's browser enhancers and other device configuration information.

97. Companies include: 41st Parameter, CyberSource, Arcot, Iovation, ThreatMetrix, Blue Cava, and Scout Analytics.

98. I say "probably" because an applicant could have a family member with a disability or use the disability program for convenience, like using a text-to-speech program while driving.

99. Americans with Disabilities Act, 42 U.S.C. §§ 12112(a) & 12112(b)(5) (2012).

100. *Id.* at §§ 12112(b)(6) and (7).

101. COGNITIVE PERFORMANCE TESTING SERVICES, <http://cognitivetestingservices.com> (last visited Aug. 13, 2012).

102. This analysis is beyond the scope of this paper.

The next option for an employer to learn whether the applicant has a disability is through a background check. The scope of information revealed by a background check depends on the level of the investigation. The price of the background check will vary depending on the thoroughness of the background check. Like the pre-employment test, the employer would have to weigh the costs associated with a thorough enough background check to discover a disability versus the costs associated with recording and analyzing an applicant's browser enhancers. Furthermore, the employer must consider what additional information a background check might disclose beyond the data the employer could obtain from the applicant's browser enhancers.¹⁰³

The last option for a potential employer to learn whether an applicant has a disability is to simply ask the applicant. Asking the applicant is probably the least expensive and the easiest option. However, the accuracy of this option is questionable because the applicant may lie. Additionally, asking such a question may open the door to potential liability for discriminatory hiring procedures.

In summary, there are several ways to learn whether an applicant has a disability. However, the data capture and analysis of computer-based information, including installed browser enhancers, via website server access appears to be one of the least expensive and least obvious methods of determining whether the applicant might have a disability.

3. Current Employer Discovering a Disability Browser Enhancer

Now picture Cat. Cat has high-functioning autism. She is extremely intelligent and has a Ph.D., but she has difficulty maintaining a conversation and picking up on social cues. She uses a browser enhancer, such as Texthelp's Read&Write Web, that has reading capabilities and can simplify the content on her computer screen.¹⁰⁴ Cat's browser enhancer allows her to perform many work tasks more efficiently than without the browser enhancer. Cat has not told her boss, or anyone else with whom she works, that she has autism. One day she has computer problems at work and the company IT person gives her an internal company website with instructions to follow in order to diagnose the

103. This analysis is beyond the scope of this paper.

104. WYNN and Read&Write Gold are full computer programs that run on a device's operating system, not browser enhancers. However, Texthelp now offers a Web App called Read&Write Web that runs in the user's Internet browser. Additionally, there are complete browsers for people with autism (e.g., Zac Browser). According to the University of Colorado Disability Services in November 2010, most CU students used WYNN or Read&Write Gold rather than a browser plug-in. However, this is changing because Texthelp now offers Read&Write Web, which can be used on an iPhone, a smart phone, a laptop, or a tablet. *Texthelp Web Apps*, *supra* note 43.

problem. The company website sends the IT person Cat's computer configuration information, including her browser enhancers. The IT person sees the unusual browser enhancer, performs a quick search, and learns it is designed for people with learning disabilities and autism. The IT person plays poker weekly with Cat's boss, and mentions the unusual browser enhancer to Cat's boss at their next poker night.¹⁰⁵

a. Why Would a Current Employer Care About Browser Enhancers?

It is unlikely that a current employer will go searching for browser enhancer information for all of its employees. However, there are a few situations in which an employer might proactively solicit information regarding a particular individual's browser enhancers. As noted above, the employee's browser enhancers can reveal personal information about the employee without requiring the employer to ask the employee about this information. The employer could learn that the employee has a vision impairment, has a hearing impairment, has a cognitive disability, is color blind, has another particular disability, or that the employee is trying to conceive a child.

The first situation is when an employee has a computer problem, like Cat, and the information is revealed during a diagnostic of the employee's computer. What the employer does with the information about the installed browser enhancers depends entirely upon the employer.

The next situation occurs when the employee is poorly performing her job. In this instance, the employer may want to know if there is a reason why the employee is not performing well. The employer may truly care about the employee and may want to know if there is a way to help the employee improve her performance. By scanning an employee's work computer, the employer could discover whether the employee has a browser enhancer that is designed for people with disabilities. The employee may be embarrassed to tell her employer and the employer may feel that knowing about the employee's disability will help the employer better communicate with the employee. The same is true if the employer is having difficulty communicating with the employee, as is often the case with autistic people. Again, the employer may want to know about the employee's disability, but does not want to ask the employee for fear of embarrassing the employee.

The other side of this situation is when the employee is not performing well and the employer wants to find a reason to terminate the

105. Note that a company can usually see an employee's device configuration information when the employee's device is connected to the company's intranet or internal servers. Furthermore, employers can put tracking software on employees' devices.

employee. The employer cannot terminate an employee based on the disability alone, unless the disability prohibits the employee from performing the tasks required by her job with reasonable accommodations.¹⁰⁶ However, the employer could use her disability and the fact she has an accommodation in the form of a browser enhancer as a legal reason for termination because the employee is not capable of fulfilling the job requirements with a reasonable accommodation.

It is also possible that an employer may be concerned with on-the-job time management or performance and may want to know what employees are doing on their computers. Many employers watch and track employees' Internet usage.¹⁰⁷ Furthermore, an employer may want to track an employee's Internet usage to ensure legal usage.¹⁰⁸ The employer could easily scan the employee's computer—if the computer is on the employer's network—to learn more about the employee's Internet usage through the list of the employee's browser enhancers. The employee's installed browser enhancers may indicate to the employer the ways in which the employee uses the Internet. For example, if the employee has Google Earth and various RSS feeders installed, then the employer may assume that the employee looks up locations on maps and reads the news on different RSS feeds.¹⁰⁹

Lastly, most people who have worked in an office are familiar with office politics. Clashing personalities could cause an employer to search for reasons to dismiss an employee, including dismissing an employee because she has a disability—though this may not be legal.

As stated, there are many reasons why an employer may want to know what browser enhancers its employee has installed.

*b. Could a Current Employer Detect an Employee's
Browser Enhancers and Discover a Disability?*

It is very likely that an employer could easily collect the applicant's browser enhancers and other device configuration information if the employee connects his computer to the employer's network. When an employee is at work and his computer or other device is connected to the company's network and/or Internet, the company IT administrator has

106. 42 U.S.C. § 12112(b)(5). See 42 U.S.C. § 12111(9) for the definition of "reasonable accommodation."

107. Jenna Green & Todd Ruger, *DEA, V.A. Bought Spy Software: Employee Surveillance Raises Concerns for Whistleblowers*, NAT'L L. J. (July 30, 2012), <http://www.law.com/jsp/nlj/PubArticleNLJ.jsp?id=1202564724828>.

108. i.e., not using the Internet access for pornography, illegally downloading music and movies, etc.

109. Note that neither of these uses is necessarily bad. It is just an example showing what an employer may infer from different installed browser enhancers.

the ability to see every keystroke made by an employee.¹¹⁰ Therefore, discovering a browser enhancer is probably easiest when the employee is working on a device connected to the company's network because the employer can see almost everything the employee does on his device and on his web browser on that device.¹¹¹

For the same reasons mentioned above in Section I.B.2.b, and considering that some companies are already collecting and analyzing computer configuration information,¹¹² it is plausible for an employer to collect and store the same information.

c. If the Most a Current Employer Can Learn is X, is there an Easier Way to Learn X?

As discussed in Section I.B.3.a, an employer can learn whether an employee probably has a disability or other hidden condition if the employee uses a browser enhancer for his disability or condition.¹¹³

After an employer hires an employee, there are many ways, other than looking at the employee's installed browser enhancers, for an employer to learn whether the employee has a disability. The most obvious way is by talking and interacting with the employee. If an employer suspects an employee has an unannounced disability but cannot determine the employee's precise disability or if the employer is not certain and wants to know whether the employee has a disability, then the employer may resort to other methods of detection.

One method of disability detection is to ask the employee whether she has a disability. However, the accuracy of this method is questionable because the employee can easily lie to the employer by denying her disability or the severity of her disability. If the employee lies, and the employer suspects she is lying, then the employer will have to resort to another detection method. Additionally, asking the employee may have other negative effects: it could embarrass or anger the employee and it could strengthen the employee's discrimination claim if she is ever harassed, treated subpar, or fired.

Like the pre-employment testing method mentioned above in Section I.B.2.c, an employer could require current employees to take a brain function test. One company advertises its current employment testing.¹¹⁴ Provided that the employer requires other employees to take

110. BAGLEY & DAUCHY, *supra* note 95, at 302.

111. *Id.*

112. Companies include: 41st Parameter, CyberSource, Arcot, Iovation, ThreatMetrix, and Scout Analytics.

113. I say "probably" because an applicant could have a family member with a disability or use the disability program for convenience, like using a text-to-speech program while driving.

114. COGNITIVE PERFORMANCE TESTING SERVICES, <http://cognitivetestingservices.com>

the cognition test along with the employee who is suspected to be disabled, the employer will likely be within the limitations of the law.¹¹⁵ An employer may require a medical examination or inquire about an employee's disability if "such examination or inquiry is shown to be job-related and consistent with business necessity."¹¹⁶

An employer may also be able to discover whether an employee has a disability through the employee's medical information. If the employer pays for the employee's health insurance as part of her benefits, the employer could claim it has a right to review the employee's medical claims. This scenario involves the Health Insurance Portability and Accountability Act (HIPAA), which is beyond the scope of this paper.¹¹⁷

Whether an employer uses a brain function test or a program to detect installed browser enhancers to determine if the employee has a disability depends on the economics, benefits, and burdens of each method. The company would need to conduct a cost comparison of the testing and the browser enhancer detection software. Both the upfront cost of each method (i.e., fixed costs) along with the cost per employee of each method (i.e., variable costs) must be considered. The cost comparison is an economics equation to determine which method is the cheapest per employee and overall. The employer must also consider what additional information, and the accuracy of that information, can be obtained through brain function testing as compared to the additional information obtained from the list of the employee's browser enhancers.

In summary, the software needed to detect an employee's installed browser enhancers or simply watching the employee's Internet usage over the employer's network appear to be cheaper than the brain function testing and more expensive than asking the employee. Additionally, looking at the employee's installed browser enhancers is more secretive and easily hidden from the employee as compared to asking the employee or requiring the employee to take a cognition test.

4. Insurance Company Learning the Customer has a Disability

Consider Henry, who has Central Auditory Processing Disorder (CAPD) and slight hearing loss. CAPD is a receptive language disorder, which makes it difficult to process sounds, particularly speech sounds.¹¹⁸

(last visited Nov. 27, 2010).

115. 42 U.S.C. § 12112.

116. *Id.* § 12112(d)(4)(A).

117. Pub. L. No. 104-191, 110 Stat. 1936 (codified as amended in scattered sections of 29 U.S.C. and 42 U.S.C.).

118. (Central) Auditory Processing Disorder – The Role of the Audiologist, AMERICAN SPEECH-LANGUAGE-HEARING ASSOC., <http://www.asha.org/docs/html/ps2005-00114.html>, (last visited Aug. 14, 2012).

Some people with CAPD also have hearing loss, while others do not.¹¹⁹ Henry uses a browser enhancer similar to iCommunicator software and MAGpie software.¹²⁰ Henry's browser enhancer translates speech to text, speech or text to video sign language, and speech or text to a computer generated voice in real-time.¹²¹ This browser enhancer helps Henry by converting a website's video or other auditory component into text. After graduating from college and accepting his first job, Henry is filling out an online health questionnaire from his new health insurance company. The health insurance company records each customer's computer configuration information to learn if that person has a pre-existing condition that the customer has not disclosed to the insurance company. The health insurance company discovers that Henry has a speech-to-text browser enhancer installed on his device. The insurance company knows that people with hearing impairments typically use Henry's browser enhancer. Therefore, the health insurance company decides to charge Henry 25% more money for coverage than it charges its average customer.

a. Why Would an Insurance Company Care About Browser Enhancers?

An insurance company would benefit from the knowledge of a potential or current customer's browser enhancers for many reasons.¹²² First, most insurance companies are in the business of making money and maintaining profits; therefore, the rates they charge customers must be greater than the amount they will have to pay in coverage plus the costs of running a business.

Accordingly, a health insurance company typically wants to know whether a potential customer has a pre-existing condition before agreeing to provide coverage to that customer because the pre-existing condition

119. *Id.*

120. See generally iCOMMUNICATOR, <http://www.mycommunicator.com> (last visited July 30, 2012) ("iCommunicator promotes independent communication for persons who are deaf or hard-of-hearing and encourages increased literacy by "translating" English a number of ways."); Download MAGpie, NAT'L CTR. FOR ACCESSIBLE MEDIA, http://ncam.wgbh.org/invent_build/web_multimedia/tools-guidelines/download-magpie (last visited July 30, 2012) (MAGpie is free software for adding captions and video descriptions to QuickTime, Windows Media, Real and Flash multimedia.). Additionally, Google has launched its "auto caption" feature for new YouTube uploads. The feature will attempt to use text-to-speech software, the same type used by Google Voice, to automatically generate captions from the video's soundtrack. CAPTION IT YOURSELF, <http://www.dcmp.org/CIY> (last visited July 30, 2012).

121. These features are similar to iCommunicator, *Product Information*, iCOMMUNICATOR, <http://www.mycommunicator.com/productinfo> (last visited July 30, 2012).

122. For the purposes of this paper, I will only consider car insurance and health insurance companies. Only these two types of insurance companies are discussed because other insurance models are very similar and cannot be discussed without significant repetition.

may affect the amount the insurance company will have to pay in coverage. If the health insurance company knows of the pre-existing condition, then it either can deny coverage entirely, deny coverage for medical treatment related to that condition, or increase the premium amount to be paid by the customer. To be profitable, a health insurance company must charge the customer more money than it will pay in coverage for that customer, or the insurance company must charge everyone together more than it will pay in total coverage to everyone. Therefore, the insurance company would like to know whether a customer has a disease or disability before setting that customer's rates. If the insurance company does not ask or care about pre-existing conditions, then the insurance company must charge all of its customers an average rate to compensate for the customers with more medical needs. To accurately determine its coverage costs, the insurance company needs as much information as possible about the customer's medical conditions.

The same is true for a car insurance company: it must charge the customer more money than it will pay in coverage over the lifetime of that customer's coverage. The insurance company must balance the risk of the customer with the benefits, meaning the insurance company must consider the likelihood that the customer will cause a car accident and correlate this likelihood to the customer's rates. The car insurance company will want to know as much information as possible about the customer's driving history, age, sex, car type, and other personal conditions affecting the customer's driving ability before setting that customer's rates. The car insurance company may have statistics correlating vision or hearing impairments to a greater number of car accidents in a similar manner to its statistics showing that young male drivers have more accidents and insurance claims than similarly aged female drivers or older male drivers.¹²³

Insurance companies are for-profit businesses; thus, their business model drives their desire to collect accurate information about their customers. Accordingly, a health or car insurance company would be very interested in learning whether a person has a hidden disability that may affect the magnitude of person's insurance claims. Therefore, if an insurance company could learn about a customer's disability through the

123. See, e.g., *Driving Statistics with Gender Comparison*, GORDEAN'S BLOG (Aug. 28, 2006), <http://blog.gordae.com/2006/08/28/driving-statistics-with-gender-comparison>; *TeleNav- Commissioned Survey Suggests Both Genders Have Similar Views on Abiding by and Breaking the Rules of the Road*, TELENAV (July 14, 2010), <http://www.telenav.com/about/driving-behavior>; *Women Drivers? They're Safer than Men*, NBCNEWS.COM (Jan. 20, 2007, 2:04 PM), http://www.msnbc.msn.com/id/16698153/ns/technology_and_science-science/t/women-drivers-theyre-safer-men.

customer's browser enhancers, the insurance company would definitely care about the customer's installed browser enhancers, especially if the disability would affect the customer's insurance claims.

b. Could an Insurance Company Detect Browser Enhancers?

As is true for the aforementioned employer sections,¹²⁴ it is also very likely that an insurance company could easily collect the customer's browser enhancer information and other device configuration information if the insurance company interacts with the customer online. Websites currently ask for much of this information to ensure the website viewer receives correctly formatted content. Additionally, programs currently exist that collect and analyze device configuration information, including the user's installed browser enhancers. Furthermore, it is likely that insurance companies, like banks, are already using these programs to create device fingerprints to protect their customers from hackers accessing the customers' private information. Therefore, it would not take the insurance company significant time or money to save a customer's device configuration information, including the applicant's browser enhancers, and associate that information with a specific customer when the customer visits the insurance website and logs into his account—if the insurance company is not already saving such information. The insurance company would either need to buy device-fingerprinting software (which it may already have), hire a device-fingerprinting company to develop software designed to save the user's browser enhancer information, or contract a computer programmer to develop similar software for the company that takes the configuration information already transmitted by the user's device and outputs that information into a document. If the insurance company already has such device fingerprinting software, then the only remaining step is to look at the customer's browser enhancers, or other device configuration information, to determine whether the customer has a disability-specific browser enhancer installed.

c. If the Most an Insurance Company can Learn is X, is there an Easier Way to Learn X?

As discussed in Section I.B.4.a, an insurance company can learn whether a customer probably has a disability or other hidden condition if the employee uses a browser enhancer for his disability or condition.

There are ways other than through browser enhancer detection software that an insurance company may learn of a customer's disability.

124. See Sections I.B.2.b and I.B.2.c, *infra*.

The first and most obvious way is to ask the customer whether she has a disability or other pre-existing condition, but the likelihood that a customer will tell the truth is questionable. A customer can easily lie to the insurance company and deny having a disability. Additionally, it is much easier to lie on an online form than it is to lie to a person's face.¹²⁵ Plus, it may be difficult for an insurance company to detect whether a customer omits information on his online form. If the insurance company suspects the customer is lying, then it will have to resort to another detection method to discover the truth.

The second way an insurance company could determine whether a customer has a disability is to request the person's medical records.¹²⁶ However, requesting medical records can be expensive and tedious. In addition, a customer may refuse to tell the insurance company about his disability and may refuse to submit his medical records. If the customer refuses to disclose his disability, then the benefits of the browser enhancer detection software increase because there are few other ways for the insurance company to acquire such information.

Yet another way to determine whether a customer has a disability is to do a background check on the customer. However, this method is expensive and the customer usually must give his permission before the entity requesting the background check can proceed with the background check.

When looking at the business model of an insurance company, it is obvious that the company could more accurately determine a customer's fees by knowing information about the customer's pre-existing conditions and other conditions, such as disabilities, that affect the customer's health and car insurance claims. If the cost of browser enhancer detection and storage software is lower than the costs incurred from knowing a customer has a disability, then the insurance company will use the software. Furthermore, the cost of the browser enhancer detection software must be compared to the cost of requesting medical records or performing a background check. Upfront costs and costs-over-time of each method should be compared. Additionally, the accuracy of the browser enhancer detection software should be evaluated against the accuracy of asking whether the customer has a disability and the accuracy of other detection methods.

In summary, determining which detection method to use, if any, depends upon the cost-benefit analysis by the insurance company.

125. Ross Gendels, *Does Closeness Effect Lying Online Versus Lying In-Person?*, (July 9, 2012), <http://www.christopherxjensen.com/wp-content/uploads/2012/05/gendels-ross-research-paper.pdf>; Julian J. Dooley, Jacek Pyzalski, & Donna Cross, *Cyberbullying Versus Face-to-Face Bullying*, 217 J. PSYCHOL. 182, 182-83 (2009), available at http://icbtt.arizona.edu/sites/default/files/cross_set_al_cyber_vs_face-to-face.pdf.

126. This treads into HIPAA grounds, which is beyond the scope of this paper.

C. *Harms from These Threats*

The various scenarios described above in Section I.B mention different harms to the characters involved as a result of discovering a person's disability through browser enhancer detection: Jimmy does not get the job, Cat may be harassed by her boss or employees, and Henry must pay higher premiums for his insurance. Therefore, if employers and insurance companies use browser enhancer detection to discover disabilities and discriminate against people with disabilities, then many Americans will be harmed by this practice.

Unfortunately, discrimination and harassment stories against people with disabilities are easy to find. The ten-year-old forced to eat his own vomit and the drug dealer from Harlem are only two of many modern stories.¹²⁷ Additionally, employment discrimination cases range from failing to give a factory assembly line employee a reasonable accommodation for her carpal tunnel syndrome¹²⁸ to an electrician having his offer revoked after his muscular dystrophy was discovered in a post-offer/preemployment physical¹²⁹ to a man with epilepsy being fired after having eight "light" seizures at work.¹³⁰

Furthermore, many people with disabilities are unable to work; therefore they have less money to pay for items such as health and car insurance. As the numbers in Part II will show, there is a much higher unemployment rate among disabled people than among people without mental or physical impairments.¹³¹ Additionally, people with disabilities are often paid less than people without disabilities.¹³² Therefore, charging a person with a disability a higher insurance premium means that he is paying for his disability in two ways: first by being paid less at work and second by paying a higher insurance premium.

Society benefits from inclusion by all because when everyone contributes, society as a whole is better off.¹³³ Disabled people are happier and contribute more to society when they feel included.¹³⁴ Disabilities often prevent people from engaging in the same activities in which people without disabilities participate. Discrimination harms more than just the person against whom the discrimination occurs because

127. *White v. Clark County Sch. Dist.*, 197 F.3d 1271, 1272-3 (9th Cir. 1999); PHILIP BOURGOIS, *IN SEARCH OF RESPECT: SELLING CRACK IN EL BARRIO* 188-89 (2d ed. 2003).

128. *Toyota Motor Mfg., Ky., Inc. v. Williams*, 534 U.S. 184 (2002).

129. *McClure v. General Motors Corp.*, 75 F. App'x 983 (5th Cir. 2003).

130. *Todd v. Academy Corp.*, 57 F. Supp. 2d 448, 449-50 (S.D. Tex. 1999).

131. KAYE, *supra* note 92, at 70-75.

132. *Id.*

133. Discussion among participants at the round table on Cloud Computing and Disability Communities: How Can Cloud Computing Support a More Accessible Information Age and Society? Co-hosted by the Coleman Institute for Cognitive Disabilities and Silicon Flatirons Center, University of Colorado at Boulder (July 30, 2010) (draft report on file with the author).

134. *Id.*

others in society feel the effects of the discrimination. Therefore, discrimination and harassment in the workplace harm society as a whole. Furthermore, not hiring a person because of his disability means that more disabled people are unemployed. Depression and other mental conditions are common among the disabled community, primarily because of discrimination and harassment.¹³⁵ Society as a whole would benefit from the increased workforce and overall decreased depression rate if disabled people were openly allowed to work alongside others in society.

If employers and insurance companies use browser enhancer detection methods to discover people's disabilities and discriminate against people with disabilities, then disabled Americans will be harmed and society as a whole will feel the effects of this harm.

II. DISABILITY BACKGROUND INFORMATION AND THE AMERICANS WITH DISABILITIES ACT

A. *Disability Background Information*

1. Definitions and Numbers

Approximately 54 million Americans have some sort of disability.¹³⁶ However, the definition of "disability" and the requirements to qualify as having a "disability" differ from state to state and from federal agency to federal agency.¹³⁷

In addition to disputes over the definition of disability, there are also

135. *Id.*

136. *Understanding Disabilities*, U.S. ENVTL. PROT. AGENCY, <http://www.epa.gov/inter508/technology/disabilities.htm> (last visited Aug. 13, 2012).

137. See, e.g., *Disability Planner: What We Mean By Disability*, U.S. SOC. SEC. ADMIN., <http://www.ssa.gov/dibplan/dqualify4.htm> (last modified Apr. 2, 2012).

The definition of disability under Social Security is different than other programs. Social Security pays only for total disability. "No benefits are payable for partial disability or for short-term disability."

"Disability' under Social Security is based on your inability to work. We consider you disabled under Social Security rules if:

- You cannot do work that you did before;
- We decide that you cannot adjust to other work because of your medical condition(s); and
- Your disability has lasted or is expected to last for at least one year or to result in death."

See also *Employment Information for People With Disabilities*, U.S. ENVTL. PROT. AGENCY, <http://www.epa.gov/ezhire/disabilities.htm> (last visited Aug. 13, 2012) (defining disability as one that meets the definition prescribed by the Rehabilitation Act of 1973 (Pub. L. No. 93-112, 87 Stat. 394) and the Americans with Disabilities Act of 1990 (Pub. L. No. 101-336, 104 Stat. 327)).

disputes as to the definition of a cognitive disability.¹³⁸ The Coleman Institute website states:

Cognitive disability stems from a substantial limitation in one's capacity to think, including conceptualizing, planning and sequencing thoughts and actions, remembering, and interpreting the meaning of social and emotional cues, and of numbers and symbols. Common consequences of cognitive disability include stigma and discrimination, social isolation, difficulty communicating, poverty, and institutionalization. Moreover, as societies become more technology reliant, a rapidly growing "digital divide" is developing between persons who are competent to use emerging technologies and those with cognitive limitations who are not competent to do so without adaptive personalized modifications and training.¹³⁹

According to one group, in 2010 there were over 23 million people in the United States with impaired cognitive function, such as intellectual disabilities, severe and persistent mental illness, brain injury, Alzheimer's disease, and stroke complications.¹⁴⁰ Some people argue that this number is too high because categories are not clearly defined, which results in double counting.¹⁴¹ Still others say 23 million is too low because some individuals do not self-identify, a large number of Americans have aging symptoms resulting in cognitive impairment, and others do not know they have a disability.¹⁴²

The concept of cognitive disabilities is extremely broad, but basically a person with a cognitive disability has greater difficulty with one or more types of mental tasks than the average person.¹⁴³ Additionally, someone with profound cognitive disabilities will need assistance with almost every aspect of daily life.¹⁴⁴ In fact, some believe that the majority of web content cannot be made accessible to individuals with profound cognitive disabilities because this content will always be too complex for certain audiences.¹⁴⁵

138. See *Definitions of "Cognitive Disability,"* CLEAR HELPER, <http://clearhelper.wordpress.com/2010/01/19/definitions-of-cognitive-disability/> (last visited Aug. 13, 2012); see also *Overview*, COLEMAN INSTITUTE, <http://www.colemaninstitute.org/overview.php> (last visited Aug. 12, 2012).

139. *Background*, COLEMAN INSTITUTE, <https://www.cu.edu/ColemanInstitute/background.html> (last visited Aug. 13, 2012).

140. Dr. David Braddock's research presented at the Cloud Computing and Disability Communities Round Table, *supra* note 133. David Braddock, Ph.D., Executive Director, Coleman Institute Associate Vice President, University of Colorado System.

141. *Id.*

142. *Id.*

143. *Cognitive Disabilities*, WEBAIM, <http://webaim.org/articles/cognitive> (last visited Aug. 13, 2012).

144. *Id.*

145. *Id.*

2. Working with a Disability

Working with a disability can be difficult; therefore, many people with disabilities are unemployed or underemployed. Only 24% of working-age adults in the United States with severe mobility impairment are employed.¹⁴⁶ Furthermore, only 31.5% of working-age adults with mental retardation, 33% with a mental health disability, 34% with a severe visual impairment, 35% with difficulty communicating, 49% with a severe hearing impairment, 51.5% with a moderate visual impairment, 53% with a learning disability, and 68% with a moderate hearing impairment are employed.¹⁴⁷ Note that all of these percentages are below 78.5%, which is the percentage of adults without a functional limitation who are employed.¹⁴⁸ The unemployment rates of working-age adults with a disability are also significantly higher than the unemployment rate of adults without a functional limitation.¹⁴⁹

Workers with disabilities earn 81¢ for every dollar earned by a non-disabled worker.¹⁵⁰ Typically workers with disabilities lack the education, job skills, experience, and work history needed to compete in the labor market.¹⁵¹ Accordingly, when these factors are accounted for in the earning gap, workers with disabilities earn 86¢ for every dollar earned by a non-disabled worker.¹⁵² Furthermore, the earning gap is larger for people with mental retardation or a learning disability, earning 31¢ or 64¢, respectively, for every dollar earned by a worker without a cognitive impairment.¹⁵³

Lastly, Americans living with a disability are more likely than other adults to live in lower-income households. Approximately 46% of adults with a disability live in households with an annual income of \$30,000 or less, as compared to 26% of adults who do not have a disability and live in a household with the same annual income level.¹⁵⁴

3. Computer Users with Disabilities

Microsoft commissioned a study on adult computer users in the

146. KAYE, *supra* note 92, at 70-71.

147. *Id.*

148. *Id.*

149. *Id.* (The unemployment rate of people with mental health disabilities in 2001 was 16%, as compared to 4% of people without a functional limitation.).

150. *Id.* at 73.

151. *Id.*

152. *Id.* at 74.

153. *Id.* at 75.

154. SUSANNAH FOX, PEW INTERNET & AMERICAN LIFE PROJECT, AMERICANS LIVING WITH DISABILITY AND THEIR TECHNOLOGY PROFILE 2 (2011), *available at* http://pewinternet.org/~media/Files/Reports/2011/PIP_Disability.pdf

United States.¹⁵⁵ The Microsoft survey found that one in four adults using computers has a vision difficulty, one in four has a dexterity difficulty, and one in five has a hearing difficulty.¹⁵⁶ The survey also found that 16% of adult computer users have a cognitive difficulty or impairment and 3% have a speech difficulty or impairment.¹⁵⁷

The Princeton Survey Research Associates International also conducted a survey of 3,001 adults, age 18 and older, regarding their Internet usage.¹⁵⁸ Only 54% of adults living with a disability use the Internet, as compared to 81% of adults who report no disability and use the Internet.¹⁵⁹

B. The Americans with Disabilities Act

The Americans with Disabilities Act (“ADA”) was originally enacted in 1990 to prevent discrimination against people with disabilities.¹⁶⁰ It was amended by the Americans with Disabilities Act Amendments Act in 2008 (“ADAAA”) to further define “disability” and to overrule a few U.S. Supreme Court decisions.¹⁶¹

The express purposes of the ADAAA are, among other things:

- (1) To carry out the ADA’s objectives of providing “a clear and comprehensive national mandate for the elimination of discrimination” and “clear, strong, consistent, enforceable standards addressing discrimination” by reinstating a broad scope of protection under the ADA;
- (2) To reject the requirement enunciated in *Sutton* and its companion cases that whether an impairment substantially limits a major life activity is to be determined with reference to the ameliorative effects

155. Study commissioned by Microsoft Corporation and conducted by Forrester Research, Inc., *The Market for Accessible Technology: The Wide Range of Abilities and Its Impact on Computer Use*, MICROSOFT (2003), www.microsoft.com/enable/research/computerusers.aspx.

156. *Id.*

157. *Id.*

158. FOX, *supra* note 154, at 2.

159. *Id.* at 3.

160. Americans with Disabilities Act of 1990 (ADA), Pub. L. No. 101-336, 104 Stat. 327 (1990) (codified as amended at 42 U.S.C. § 12101 (2008)).

161. *E.g.*, *Sutton v. United Air Lines, Inc.*, 527 U.S. 471 (1999) (ruling that whether an impairment substantially limits a major life activity is to be determined with reference to the ameliorative effects of mitigating measures. The Court also adopted a restrictive reading of the meaning of being “regarded as” disabled under the ADA’s definition of disability); *Toyota Motor Mfg. Ky., Inc. v. Williams*, 534 U.S. 184 (2002) (holding that the terms “substantially” and “major” in the definition of disability “need to be interpreted strictly to create a demanding standard for qualifying as disabled” under the ADA, and that to be substantially limited in performing a major life activity under the ADA, “an individual must have an impairment that prevents or severely restricts the individual from doing activities that are of central importance to most people’s daily lives.”).

of mitigating measures;

(3) To reject the Supreme Court's reasoning in *Sutton* with regard to coverage under the third prong of the definition of disability and to reinstate the reasoning of the Supreme Court in *School Board of Nassau County v. Arline*, 480 U.S. 273 (1987), which set forth a broad view of the third prong of the definition of handicap under the Rehabilitation Act of 1973;

(4) To reject the standards enunciated by the Supreme Court in *Toyota* that the terms "substantially" and "major" in the definition of disability under the ADA "need to be interpreted strictly to create a demanding standard for qualifying as disabled," and that to be substantially limited in performing a major life activity under the ADA "an individual must have an impairment that prevents or severely restricts the individual from doing activities that are of central importance to most people's daily lives";

5) To convey congressional intent that the standard created by the Supreme Court in *Toyota* for "substantially limits," and applied by lower courts in numerous decisions, has created an inappropriately high level of limitation necessary to obtain coverage under the ADA;

(6) To convey that it is the intent of Congress that the primary object of attention in cases brought under the ADA should be whether entities covered under the ADA have complied with their obligations, and to convey that the question of whether an individual's impairment is a disability under the ADA should not demand extensive analysis; and

(7) To express Congress' expectation that the EEOC will revise that portion of its current regulations that defines the term "substantially limits" as "significantly restricted" to be consistent with the ADA as amended.¹⁶²

The findings and purposes of the ADAAA "give clear guidance to the courts and . . . [are] intend[ed] to be applied appropriately and consistently."¹⁶³

1. Disabilities under the ADA

The Americans with Disabilities Act defines the term "disability" as: "with respect to an individual—(A) a physical or mental impairment

162. Americans with Disabilities Act (ADA) Section 2(b), Pub. L. No. 101-336, § 2(b), 104 Stat. 327 (1990) (codified as amended at 42 U.S.C. § 12101 (2008)).

163. 154 Cong. Rec. 18,516, 18,517 (2008) (Senate Statement of Managers to Accompany S. 3406).

that substantially limits one or more major life activities of such individual; (B) a record of such an impairment; or (C) being regarded as having such an impairment.”¹⁶⁴

The ADA prohibits discrimination against persons with disabilities in the workplace.¹⁶⁵ During the pre-employment process, employers “shall not conduct a medical examination or make inquiries of a job applicant as to whether such applicant is an individual with a disability or as to the nature or severity of such disability.”¹⁶⁶ The same is true after an applicant is hired as an employee.¹⁶⁷ However, an employer may require a medical examination or inquire about an applicant’s or employee’s disability if “such examination or inquiry is shown to be job-related and consistent with business necessity.”¹⁶⁸

Additionally, employers are required to provide “reasonable accommodations” to assist employees in overcoming the disability.¹⁶⁹ Under the ADA,

The term “reasonable accommodation” may include—

(A) making existing facilities used by employees readily accessible to and usable by individuals with disabilities; and

(B) job restructuring, part-time or modified work schedules, reassignment to a vacant position, acquisition or modification of equipment or devices, appropriate adjustment or modifications of examinations, training materials or policies, the provision of qualified readers or interpreters, and other similar accommodations for individuals with disabilities.¹⁷⁰

The median cost for a job accommodation is \$250, with 70% of accommodations costing \$500 or less.¹⁷¹ A majority of employers making accommodations suggested by the Job Accommodation Network (JAN), a service of the President’s Committee on Employment of People with Disabilities, report that they have improved productivity and a higher retention rate of employees who would have otherwise been

164. 42 U.S.C. § 12102(1). For definitions of key terms in the disability definition, see id. §§ 12102(2)–(4).

165. 42 U.S.C. § 12112.

166. *See id.* § 12112(d)(2)(A).

167. *See id.* § 12112(d)(4)(A).

168. *Id.* *See also id.* § 12112(d)(2)(B).

169. *Id.* § 12112(b)(5).

170. *Id.* § 12111(9).

171. Joseph Gaffama et al., *Employer Benefits and Costs of Employing a Person with Disability*, INSTITUTE OF DISABILITY STUDIES, <http://www.worksupport.com/documents/employerBenefits.txt> (last visited Aug. 13, 2012); KAYE, *supra* note 92, at 72.

lost.¹⁷² The median savings reported by employers offering accommodations is \$10,000, which is 40 times the median cost of the job accommodation.¹⁷³

2. Browser Enhancer Detection Under the ADA

Because the ADA expressly prohibits employers from making pre-employment inquiries into an applicant's disability status, an employer who seeks to gather such information surreptitiously by looking at an applicant's installed browser enhancers violates the spirit, and probably the letter, of the ADA's ban on such inquiries. A court may well find that an employer is not allowed to look at an applicant's installed browser enhancers to learn about the applicant's disability because the ADA prohibits an employer from inquiring about an applicant's disability. Using a computer program to see a person's installed browser enhancers when that person visits a website is a way to gather information about a person's disability or other personal information without asking the person. Just as the goal of a (prohibited) disability-related inquiry is to learn something unknown before the inquiry, so too may the goal of detecting a person's installed browser enhancers also be to learn about disability status otherwise unknown before the detection. Because the goal of an inquiry by an employer is similar, if not the same, as the goal of browser enhancer detection by an employer, this detection likely violates the ADA. And clearly an employer who used such information to discriminate against an applicant would be in violation of the ADA.

3. Is the ADA Inadequate to Protect Consumers?

Even though the ADA's purpose is to eliminate and punish discrimination against people with disabilities, it does not—and cannot—prevent all discrimination.

The ADA does not expressly prohibit browser enhancer detection by employers, though it could be inferred that this detection is an “inquiry” under the ADA and, thus, is illegal. It is questionable whether browser enhancer detection is an “inquiry” as defined in the ADA, but if browser enhancer detection is an inquiry under the ADA, then the detection clearly violates the ADA. However, even if browser enhancer detection is an inquiry, it may be difficult to discover whether an employer is using browser enhancer detection to discriminate against people with disabilities. Furthermore, this type of discrimination would likely be difficult to prove in court. Thus, it is not clear what would actually prevent discrimination based on browser enhancer detection.

172. KAYE, *supra* note 92, at 72.

173. *Id.*

Additionally, people are less likely to do something illegal if they are more likely to get caught rather than if the fine for breaking the law is increased.¹⁷⁴ Therefore, if a person wants to commit a crime and there is a small chance that he will get caught for committing the crime, then the person is more likely to commit that crime. Translate this theory to discrimination via browser enhancer detection: if it is unlikely an employer will get caught for discrimination via browser enhancer detection and the employer does not want to hire people with disabilities, then the employer is more likely to use browser enhancer detection rather than other methods of detection for which the employer is more likely to get caught for discrimination.

Therefore, the Americans with Disabilities Act may be inadequate to protect people with disabilities from discrimination through browser enhancer detection.

III. LEGALITY AND SOLUTIONS

A. *The Law and Browser Enhancer Detection*

1. Is Browser Enhancer Detection Legal?

Currently an employer or insurance company can legally see a list of the user's browser enhancers. Information about the configuration of a user's device, including the user's installed browser enhancers, is public information in the sense that a website may ask the device about its configuration.¹⁷⁵ There are very good reasons for this information to be public, including the fact that knowing the device configuration information allows a website to send the device properly formatted information. Additionally, disability rights organizations push for laws requiring websites to be accessible to people with disabilities.¹⁷⁶ For a website to be accessible to different browsers and browser enhancers, the website must know what browser and browser enhancer the user is using so that the website can send properly formatted content to the user's device.

174. WILLIAM T. HARBAUGH, NACI MORCAN, & MICHAEL S. VISSER, *THEFT AND DETERRENCE* 1–3 (2011).

175. See generally Ohm, *supra* note 58.

176. See, e.g., BURTON BLATT INSTITUTE, <http://bbi.syr.edu> (last visited Aug. 1, 2012); *Access for All*, U.S. DEP'T OF JUSTICE, <http://www.ada.gov>, <http://www.ada.gov/5yearadarpt/fiveyearada1.htm> (last visited Aug. 1, 2012); *Nondiscrimination on the Basis of Disability; Accessibility of Web Information and Services of State and Local Government Entities and Public Accommodations*, U.S. DEP'T OF JUSTICE, http://www.ada.gov/anprm2010/webanprm_2010.htm (last visited Aug. 1, 2012); *2010 ADA Standards for Accessible Design*, U.S. DEP'T OF JUSTICE (Sept. 15, 2010), http://www.ada.gov/2010ADASTandards_index.htm.

Depending upon what an employer does with the browser enhancer information, such as using the information to discriminate against the user, may make the employer's actions illegal. As discussed above, the ADA expressly prohibits employers from making pre-employment inquiries into an applicant's disability status.¹⁷⁷ Therefore, an employer who seeks to gather such information secretly by looking at an applicant's installed browser enhancers with the intention of inquiring into whether the applicant has a disability probably violates the ADA's ban on such inquiries. Because the goal of an inquiry by an employer is similar, if not the same, as the goal of browser enhancer detection by an employer, this detection likely violates the ADA. Furthermore, an employer who used such information to discriminate against an applicant would clearly be in violation of the ADA.¹⁷⁸

Prior to the newly enacted Patient Protection and Affordable Care Act,¹⁷⁹ insurance companies were allowed to consider an applicant's pre-existing conditions before extending coverage to the individual. Under the 2010 Affordable Care Act, browser enhancer detection by health insurance companies may or may not be illegal.¹⁸⁰

Lastly, Internet privacy bills have been discussed in both the House and the Senate. Once final legislation is enacted, the question of whether browser enhancer detection is legal should be reassessed. However, note that the FTC Chairman, Jon Leibowitz commented on the requirements for online tracking in response to the Obama Administration's Privacy Bill of Rights, saying that online providers have committed not to release consumers' browsing data for "sensitive purposes," such as when employers are making hiring decisions or insurers are determining coverage.¹⁸¹

177. 42 U.S.C. § 12112(a).

178. Similarly, it is also probably a violation of Title VII of the Civil Rights Act of 1964, as amended by the Pregnancy Discrimination Act, for an employer to look at an applicant's or current employee's installed browser enhancers and use this information to discriminate on the basis of pregnancy, childbirth, or related medical conditions. Because the EEOC has interpreted the Pregnancy Discrimination Act to prohibit an employer from inquiring about an applicant or current employee's pregnancy, childbirth, or related medical conditions, a court would probably find that an employer is not allowed to look at an applicant or current employee's installed browser enhancers to learn about the person's pregnancy information. Accordingly, it is probably against the law for an employer to look for a woman's ovulation tracking browser enhancer.

179. Patient Protection and Affordable Care Act, Pub. L. No. 111-148, 124 Stat. 119 Stat. 1025 (2010).

180. This question is beyond the scope of this paper.

181. Jenna Greene, *Aiming to bolster privacy for Internet users, feds issue new 'Bill of Rights'*, NAT'L L.J. (Feb. 23, 2012), <http://www.law.com/jsp/nlj/PubArticleNLJ.jsp?id=1202543328657>.

2. Legal Solutions

Legal solutions, such as enacting new legislation, are one type of solution to the browser enhancer detection problem. One possible legal solution is for Congress to enact legislation to prevent employers and insurance companies from documenting the user's browser enhancers.¹⁸² Alternatively, the law could make it illegal for a website owner to save device configuration information, including installed browser enhancers, associated with a specific user unless the user authorizes the website to save this information for security reasons, such as personal banking. The downside is that enacting new laws requires individuals or special interest groups to lobby Congress and enacting new laws requires time. Furthermore, even if a law is enacted, the question of how to enforce the law becomes an issue. The Equal Employment Opportunity Commission probably could enforce the law with respect to employers because the EEOC is expressly granted the authority to enforce the ADA and is expected to amend these regulations.¹⁸³ However, it is questionable which department would enforce discrimination by insurance companies. Even with a law of this sort, it would still be extremely difficult for a person to prove that the employer or insurance company actually acquired information about the disabled person's browser enhancers, inferred the person had a disability, and acted on that information. A law would likely help the problem, but new legislation would not solve the problem.

Another legal solution is to require websites to put a label—like the third party tracking label—on the website to notify users that this website tracks the user's device configuration information, including installed browser enhancers. Again, legislation can take time and money, which is a downside to the legislation process. However, the FTC could recommend that websites use such labeling and the FTC recommendation may or may not encourage labeling.

B. Using Technology to Protect People

1. Technical Solutions

There are possible technical solutions to prevent an employer or insurance company from detecting browser enhancers. One technical solution is for the accessibility browser enhancer to have code within itself that prevents the browser enhancer from telling the website whether the browser enhancer is installed. However, a website might be able to

182. Congress has the authority to enact laws regulating the Internet under its Commerce Clause power.

183. 42 U.S.C. 12205(a).

figure out that a certain browser enhancer is installed based on a series of requests or questions the website sends to the browser.¹⁸⁴ The problem with this solution is that many browser enhancers need the website to know that the browser enhancer is installed in order to provide the user with properly formatted content. For example, a screen reader may want to tell the website that it exists to ensure that the website sends the device text instead of pictures or video because the user cannot see the pictures or video. Additionally, screen readers are less accurate at converting pictures and video to text than they are at converting text to speech. Therefore, if the website knows the user is using a device with a screen reader, then the website can send the user text in lieu of pictures and video.

Another technical solution is for the user to not use browser enhancers and instead use full computer programs that run on the user's operating system and not in the user's browser. The problem with this solution is that the program, such as a screen reader, may nevertheless tell the browser, which in turn may tell the website, that the program is running to ensure properly formatted content. Furthermore, full computer programs are often expensive and the trend is to move toward browser enhancers, including apps, that run in the user's browser and/or run in the cloud.

The last possible technical solution is for the user to use software that detects the website's level of inquiry. I am not currently aware of such software, but it could easily be developed.

2. How to Protect Yourself

To date, no tools are publically available to test a website's use of browser-fingerprinting technology.¹⁸⁵ Disabling JavaScript can prevent detection methods employed by websites; however, JavaScript is required for many websites to run properly.¹⁸⁶ Using TorButton uses two techniques to help prevent browser fingerprinting and browser enhancer detection, but it makes the browser run much slower than it would run without TorButton.¹⁸⁷ The EFF recommends improvements to the "private browsing" setting to prevent websites from tracking a user's device configuration information and browser enhancers.¹⁸⁸ Many browsers have since improved the "private browsing" setting.

184. See *Creating Accessible Flash Content*, *supra* note 64. See also *Computer Access*, *supra* note 39.

185. Lawton, *supra* note 49.

186. *Is It Possible to Defend Against Browser Fingerprinting?*, PANOPTICCLICK, <http://panopticlick.eff.org/self-defense.php> (last visited Aug. 13, 2012).

187. *Id.*

188. *Id.*

a. Disable JavaScript

Many browser detection methods used by websites require JavaScript to detect browser enhancers and fonts; therefore, one of the most powerful defenses against browser fingerprinting and browser enhancer detection is to disable JavaScript.¹⁸⁹ The downside of disabling JavaScript is that it is necessary to allow most websites to work well.

Programs such as NoScript and Adblock Plus block some sites from using JavaScript while allowing other sites to use JavaScript.¹⁹⁰ The problem is that NoScript is overprotective—it often blocks too many sites from using JavaScript—and Adblock Plus is underprotective—it often blocks too few sites from using JavaScript.¹⁹¹

b. Use TorButton

Because TorButton uses two methods to prevent browser fingerprinting, it is a strong defense. First, TorButton “standardizes” certain browser characteristics to prevent these characteristics from being seen by websites.¹⁹² This means that the browser tells the website server that it has standard settings even though it does not have standard settings. Second, TorButton blocks JavaScript in the browser. The drawback is that surfing the web through TorButton is much slower than surfing without TorButton.¹⁹³

c. Improved “Private Browsing” Modes

The EFF recommends that modern browsers improve their already present “private browsing” modes to make the browser tell the website server that all of the browser’s UserAgents, plug-in lists, and font lists have standardized values.¹⁹⁴ The downside of this approach is that the website server may not transmit properly formatted content to the user’s device. However, the user can turn the “private browsing” mode on and off depending on the websites the user is accessing.

C. The Federal Trade Commission and Consumer Harm

It is questionable whether this type of consumer harm falls within the March 2012, Federal Trade Commission Report: *Protecting Consumer Privacy in an Era of Rapid Change: Recommendations for*

189. *Id.*

190. *Id.*

191. *Id.*

192. *Id.*

193. *Id.*

194. *Id.*

Businesses and Policymakers (the “Final Report”).¹⁹⁵

I urge the FTC to consider the possible abuse of consumers’ private information through browser enhancer detection by website owners in its Final Report. The potential for misuse of information contained in a device fingerprint is especially acute for disabled individuals because they often use browser enhancers to access Internet content.

The FTC’s recommended consumer privacy framework outlined in its Final Report would apply broadly to online and offline large commercial entities that collect, maintain, share, or otherwise use consumer data that can be reasonably linked to a specific consumer, computer, or device.¹⁹⁶ The browser enhancer detection information fits within the FTC’s Final Report because employers and insurance companies are commercial entities and the browser enhancer detection is collecting and using consumer data linked to a specific consumer, computer, or device.

The Final Report contains three main components: (1) the “privacy by design” approach, (2) consumer choice in tracking (“Do Not Track”), and (3) transparency measures. Under the second component of the Final Report, the FTC should propose that companies provide choices to consumers about their browser enhancer practices. Additionally, the FTC should propose that companies impose transparency measures regarding browser enhancer detection under the third component of the Final Report.

The FTC did say in a press release, “The final report concludes that data is not ‘reasonably linked’ if a company takes reasonable measures to de-identify the data, commits not to re-identify it, and prohibits downstream recipients from re-identifying it.”¹⁹⁷

IV. OTHER AREAS OF DISCRIMINATION

Translate this discrimination to any class of people. One can imagine the many other areas of discrimination that may be implicated by an employer’s use of browser enhancer detection.

A. Ovulation Tracking

A woman may download a browser enhancer to track her ovulation because she would like to become pregnant. When the hopeful-mother-to-be applies to a potential employer online, the potential employer will see her ovulation tracker add-on. The potential employer may choose not

195. FTC PRIVACY REPORT, *supra* note 18.

196. *Id.*

197. Hayley Tsukayama, *FAQ: The FTC’s Privacy Framework*, WASH. POST (Mar. 27, 2012), http://www.washingtonpost.com/business/technology/faq-the-ftcs-privacy-framework/2012/03/27/gIQAQVwFeS_story.html.

to hire the woman because he would prefer to not pay for maternity leave; therefore, he only hires men and women past their childbearing years.

Two Chrome browser apps for tracking fertility and menstrual cycles are the My Days – Period & Ovulation Tracker app and the Strawberry Pal Menstrual Calendar app.¹⁹⁸ The JX Ovulation Calendar 2.0.125 is an ovulation calendar plug-in for Dreamweaver.¹⁹⁹ Additionally, there are many iPhone, iPad, Andriod, and BlackBerry apps;²⁰⁰ websites;²⁰¹ and computer programs that a woman can use to track her ovulation.²⁰² It is not unlikely to expect more browser apps and extensions as women move to digital or cloud-based calendars.

It is probably a violation of Title VII of the Civil Rights Act of 1964, as amended by the Pregnancy Discrimination Act, for an employer²⁰³ to look at an applicant's or a current employee's installed browser enhancers and use this information to discriminate on the basis of pregnancy, childbirth, or related medical conditions.²⁰⁴ Because the EEOC has interpreted the Pregnancy Discrimination Act to prohibit an employer from inquiring about an applicant or current employee's pregnancy, childbirth, or related medical conditions, a court would probably find that an employer is not allowed to look at an applicant or current employee's installed browser enhancers to learn about the person's pregnancy information. Therefore, it is probably against the law for an employer to look for a woman's ovulation tracking browser enhancer.²⁰⁵

198. *My Days – Period & Ovulation Tracker*, CHROME WEB STORE, <https://chrome.google.com/webstore/detail/nhfopeeobiloabklfmpobebjicddbip> (last visited Aug. 10, 2012); *Strawberry Pal Menstrual Calendar*, STRAWBERRYPAL.COM, <http://strawberrypal.com> (last visited Aug. 10, 2012).

199. *JX Ovulation Calendar 2.0.125*, SOFTWARE GEEK, <http://www.softwaregeek.com/calendar-plug-in-for-dreamweaver/p2.html> (last visited Aug. 10, 2012).

200. This website lists different fertility chart iPhone apps: *Fertility Chart iPhone Apps*, ABOUT.COM, http://contraception.about.com/od/naturalmethods/tp/fertility_apps.htm (last visited July 28, 2012).

201. A commonly used website is FERTILITY FRIEND, www.fertilityfriend.com.

202. One ovulation-tracking program is *Ovulation Calendar 2.0*, <http://www.softpedia.com/get/Others/Home-Education/DICTE-Ovulation-Calendar.shtml> (last visited Aug. 10, 2012).

203. The Pregnancy Discrimination Act covers employers with 15 or more employees, including state and local governments.

204. 42 U.S.C. §§ 2000e(k) and 2000e-2 (2012).

205. Note that Title VII governs employers, not insurance companies generally. If an insurance company is engaging in this behavior on an employer's behalf, that would violate Title VII. Title VII does not cover insurance actions outside the context of employer-provided insurance.

B. Models Based on Device Configuration

It is also possible that a company could create device configuration models for people in various age groups, races, national origins, and sex. The company would need to survey the device configurations of people in different age brackets and people of different races or national origin to determine a model based upon this information. Thus, the model would correlate specific device configurations, including browser enhancers, with users' age, race, and sex. For example, the company would know that most white females between the ages of 18 and 25 years old have a specific device configuration, whereas African American males between the ages of 30 and 39 years old usually have a different device configuration. Like the EFF's device configuration modeling, this modeling would not be difficult to create.²⁰⁶ Furthermore, this type of device configuration modeling would probably give the employer or insurance company a lot more information about the user than the employer or insurance company could discover through browser enhancer detection alone.

CONCLUSION

When a user visits a website, he allows that website to access private information about his computer's configuration. The website can determine the user's web user agent, which ranges from web browsers to screen readers and Braille browsers for people with disabilities to the operating system, software vendor, and software version. Websites also can query the user's browser for a list of installed browser enhancers. All of this information allows the server to provide properly formatted content to the user's device.

However, a user's device configuration information can be used against the user. The concern that a website owner can learn confidential information about the user is especially problematic for people with disabilities because they frequently use browser enhancers to access content on the Internet. Furthermore, many of the accessibility programs that were traditionally installed on the user's device are now available as web apps that run in the user's Internet browser. Therefore, if the user has a disability and has a browser enhancer installed that is specifically designed for his disability, then the website owner can see the browser enhancer and assume the user has a disability. Additionally, people with disabilities are often the subject of discrimination and harassment by employers.

It is very likely that an employer or an insurance company could determine that the user has a disability based on the browser enhancers

206. PANOPTICCLICK, *supra* note 1.

installed on his browser and, thus, discriminate against him. Today, many employers require applicants to apply for jobs online. Additionally, many insurance companies require interaction between the insured and the insurer online rather than by mail or phone. If this online activity is mandatory, and the data obtained is collected and archived for decision-making purposes, the question of individual privacy is at risk along with the premise that discrimination against people with disabilities becomes viable and very difficult to prove.

