Bridging the Digital and Generational Divides

A Guide for Web Site Usability for Users of All Ages

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Preface

AgeLight has published this white paper to help insure user interfaces and web sites are designed for maximum usability for active adults, seniors and other users who are new to the Internet. These guidelines are based on focus group and primary end-user research and feedback we have completed over the past 4-years.

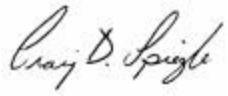
The importance of human factors is growing with the increase of longevity, respective natural physiological aspects of aging, and the integration of the Internet into our society, workplace and daily lives.

There is no greater example of the importance of usability design, engineering and testing then our nation experienced with the 2000 US Presidential election and the famous "butterfly" ballot used in Florida. Ironically, essentially no testing or usability studies were completed in an election where nearly $1 billion was spent among the candidates to get elected!

While not being the end-all solution, this paper is intended to raise awareness of design parameters and usability considerations for the increasingly varied demographics, life-stages and lifestyles of computer and internet users.

The first step to designing for different age segments and demographics is to understand generational perspectives and the dynamics specifically for seniors and the baby boomer generations. Ask yourself how will they use your product or web site, what device(s) will they use, how will they be connected (dial up or broadband), and in what environment will they be using it (work, home and / or travel).

We encourage you to consider these needs not only for adults, but also for our “Future Selves” and the fast approaching needs of the aging “baby boomers”. We must not forget that for many the Internet is a new experience. We must not champion innovative design elements over clarity. Individuals who are new to technology haven’t had the benefit of witnessing the evolution of site design and interactive media. They are more likely to be frustrated than impressed.



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Background

At the turn of this century in North America, the average life expectancy was just 46 years, yet today it has grown to over 76.[1] Thirty years from now, it is estimated one in four people in the developed world will be aged 65 and over, an increase from one in seven today.[2] Every day more and more seniors are learning about the exciting benefits of technology. As the post World War II "baby boom" generation continues to advance in age, countries throughout the world will have more seniors than ever before.[3] The ramifications of this trend are profound and far-reaching, and herald changes in all aspects of marketing and communications.[4,5] Our society is changing, and the way we communicate must change with it. Standards in design regarded as acceptable in a youth-oriented culture will simply not meet the needs of an aging population.

With this age wave, computer usage by those over the age of 55 is soaring. During the 99/00 holiday season, over 20 percent of all consumer PCs in North America were purchased by someone over the age of 55, and of those who use the Internet, they spend more time online than any other age group, nearly double that of 12–17 year-olds.[6, 7]

Such usage and computer literacy dramatically enhances the ability to making timely and informed decisions for nearly every lifestyle and life stage. From personal travel, consumer purchases and financial management to health information and being part of the political process, older computer users are realizing the potential of the web. They are enjoying email from friends and family throughout the world, finding an increased level of independent living and gaining new job skills to reenter the work force.

Since its inception, the Web has been a medium constantly surpassing itself. With the increasing availability of high-speed, broadband access, the Internet for many has become a lifestyle. We have seen the integration of audio, video, plug-ins and innovative designs that have revolutionized the way we think about and interact with the Web. Yet the design and content of many of these sites typically reflect the personality and interests of that of the designer and web master, who are often less then one-third the age of the senior user.

International Considerations

By its nature the web is worldwide. As such, many international considerations should be taken into account if your site is truly going to reach a global audience. In many developing countries, "clean" phone lines are not commonly available. In the United States and Canada, we are fortunate we pay a flat rate for local phone calls, whereas in many countries around the world,

[1] US Census Bureau and the US Administration on Aging.
[2] Peter G. Preston, *Gray Dawn*, (New York: Times Books, 1999).
[3] *Gray Dawn* by Peter G. Preston.
[4] Ken Dychtwald, *Age Wave*.
[5] Media Metrix Reports.
[6] AG Neilson and AgeLight Research, 1999.
[7] Media Metrix Reports, "Marketing to Seniors – Generational Perspectives."

people must pay for all calls on a per-minute basis. Imagine the financial impact and frustration of downloading a large Web page full of unnecessary graphics when paying the equivalent of twenty-five cents a minute to do so. From the content perspective, think about how colloquial expressions or slang might translate into another language. For example, in many cultures the term "senior" translates more favorably than "mature adult," "elder" or "senior citizen."

Physiological Changes of Aging

To reach this audience of consumers, web designers and marketers must understand the dynamics and the respective natural changes associated with aging. Typically these include diminished vision, hearing, hand eye coordination and psychomotor impairments. Some of these are accelerated by the on-set of such degenerative diseases including arthritis, diabetes, cataracts as well as macular degeneration and optic atrophy.

The most common physiological change associated with longevity is the change in ones vision. While eyeglasses and corrective surgery can help correct nearsightedness and cataracts, many others are faced with irreversible deterioration of their eyesight. It is estimated that 10 million Americans have "low vision", or "functional vision loss," that keeps them from performing normal daily activities. At least 30 percent have partial sight loss, of which 60 percent of these over the age of 55.[8, 9]

As the "boomers" age, and the usage of bifocal or trifocal corrective lenses increases, it's little wonder that eyestrain and eye fatigue becomes a reality. By age 65, most people have lost at least some of their ability to focus, have a reduced field of vision, ability to resolve images, distinguish colors and adapt to changes in light. At the same time the sensitivity to glare often increases as a result of the decreasing transparency of the lens, commonly referred to as "night blindness".

As part of natural aging, the need for contrast increases because of discoloration in the eye fluids and lens. Common impairments such as clouding of the lens, cataracts, or yellowing reduce the amount of light that passes through the eye. Yellowing of the eye lens causes images to appear as if one is looking through a yellow veil. Another result of yellowing is that less violet light is registered by the eye, which makes it easier to see reds, oranges and yellows than it does to see blues, greens and violets.[10] To test the impact, place a piece of yellow cellophane before your eyes when viewing a page.

Most people have a loss in color perception or degree of color blindness that accompanies their dimmed vision. As a result, two colors that may look very different to an individual with normal color vision may be far less distinguishable to someone with partial sight. Low contrast color

[8, 10] Cloud, Deborah. "The Medium and the Message: Communicating With Older Adults", 1996.
[9] American Optometric Association / Xerox Adaptive Technology Group.

combinations are not good choices. Don't assume that what you see will look the same to people with color deficits.

With longevity, people often experience other degenerative effects as well. Varying degrees of hearing loss are common, as is difficulty with small motor coordination, often due to arthritis, osteoporosis or stiffening of the joints. For some the simple use of mouse can be a challenge and troublesome. To understand the impact of diminished motor skills, try using your mouse with your opposite hand.

Design Considerations

1. Layout & Style
2. Color
3. Fonts
4. General Usability
5. Accessibility & Disabilities
6. Educate the User
7. Additional Resources

Layout & Style

- **Balance of type and open space**. Large areas of white space and small blocks of text increase readability. The results are your pages are cleaner and easier to navigate. Bear in mind that larger (longer) pages can mean more scrolling for the user. Consider including hyperlinks within longer pages so viewers can "jump" from section to section with a single click. It is suggested you leave a wide margin of 1 ½or more inches on the right side of the page to maximize usability with different monitor types, window sizes and display resolutions.

- **Style Sheets.** It is highly recommended you design and apply consistent "Style Sheets" throughout your site, including navigation, layouts and the interface. Style sheets allow you to pre-set all formatting options including fonts, colors, spacing and paragraph justification. Not only does this help to avoid confusion, but it also reinforces your company or organization's brand image and identity. Additionally the use of style sheets proves to be a significant time saver for updating and editing your site.

- **Hard coding**. Do not use any coding that will limit a user's ability to adjust or change his or her font, font size or colors. Insure this applies to both the content and navigation elements on your site. When a user enlarges a Web page, images, including logos, banners and buttons, aren't enlarged with the rest of the text on a page. Be wary of navigation bars and other crucial elements of a page that cannot be resized. While designers often want to maintain this control and design integrity, if a user cannot read the navigation elements, they will not be able to find the content.

- **Break topics down into succinct pages**. Many people access the Internet through computers in public facilities, such as libraries, community colleges and high schools, and prefer to print documents to take home and read at their leisure. One larger master document may result in users having to print out excessive amounts of material just to get the paragraph in which they're interested.

- **Design for Internet appliances**. Today more and more people are accessing the Internet through their televisions with Internet Appliances (IA's) such as Microsoft WebTV. Designing for a TV interface can provide a whole new series of challenges such as choosing TV-safe colors, dealing with lower resolutions and anticipating different screen proportions. To learn about designing for TV displays, visit the Microsoft WebTV Developer Site at http://developer.webtv.net/.

- **Avoid distracting background elements**. Using strong background patterns including watermarks or embossed logos can be detracting. As an alternative, a light complementary background color can be applied. Preliminary studies have also indicated that reduced eye fatigue and strain can be achieved via the use of a faint grid pattern as a background

element. Over 68% of the test groups stated they felt the glare was reduced and that the readability improved.[11]

- **Animation**. Flashing, scrolling or blinking elements or banners, can be highly distracting. For both new users and those with diminished peripheral vision, such as glaucoma or cataracts, such animation can be the difference between viewing a site and not.

- **Hand eye coordination**. For those users with diminished motor capabilities, simple double-clicking a mouse or scrolling can be difficult. It is recommended you attempt to make all graphical links large and static. Increasing the size of the area around a link, making it "hot" or selectable, can enhance ease of use. Never expect a user to click on a moving graphic element or banner. *(Also see "single-clicking" under "User Education")*

- **Paragraph justification**. Left-hand justification offers the highest level of readability. Full, (left and right justification) risks adding irregularly spacing between words and letters, due to the shorter sentence length. Center justification other then for a title, should be avoided.

Color

To use color effectively, it helps to understand three aspects; color / hue, lightness and saturation.[12] *Hue* identifies specific colors, such as blue, green, yellow, red and purple; *lightness* corresponds to how much light appears to be reflected from a surface in relation to nearby surfaces; and *saturation* is the measure of a color's intensity. A pure color has little gray and is highly saturated. Examples include "Coke red" vs. maroon. When choosing color combinations for your site consider colors that have differences in all three of these areas to provide maximum legibility.

- **Color Selection**. Designers often use a "color wheel", a tool that arranges the colors of the spectrum by their properties. Primary colors include red, blue and yellow that cannot be created by mixing other colors. Secondary colors include orange, green and purple, which are created when mixing 2 primary colors. It is recommended you choose your colors from opposite sides of the color wheel, as complementary colors will enhance your site. For example when choosing a primary color such as blue, its complementary color would be orange.

- **Colors to avoid**. Colors that are exceptionally bright, fluorescence or vibrant can have edges that appear to blur and create after-images, which tire the eyes. For example yellow text is very difficult to read. A light type color on a dark background can cause the type to

[11] October 99 study by AgeLight, including a sampling of 44, 65-74 year users.
[12] See Lighthouse International's site for more information http://www.lighthouse.org/color_contrast.htm.

appear to "close in itself". Avoid combinations of blue and yellow or red and green as many users have some degree of color deficiency or color blindness.

- **Contrast**. The ability to distinguish lightness deteriorates as we age, increasing the need for contrast between foreground and background colors. As a rule use dark type on light or white backgrounds.

Fonts

Legibility - Keeping to the most basic and common fonts may not seem very exciting, but by using them you'll ensure that your design is easily read by your audience. Drop shadows on text, often used to give words the appearance of depth, can also be difficult to decipher. Use fonts consistently throughout your site by applying style sheets, pre-setting font formatting in body text, header and title applications.

Size - Twelve to fourteen points are recommended font sizes for copy while headlines and titles are typically two points larger. Do not assume that all users know how to change their view or text size within their browser. At the same time, for those users that may make these browsers adjustments, you need to insure your size changes consistently, or you will force them to make adjustments from page to page.

Typefaces - Font families come in two general categories Serif and San Serif. Serif fonts include extra feet at the ends of the strokes and vary in line weight within the shape of each letter. In general for print applications, serif typefaces are most legible because the serif adds differentiation between letterforms, yet on lower resolution and small monitors; this may not always be true. Examples of serif fonts include Times New Roman as used in this document or Courier and Century Schoolbook. Sans Serif (without serifs) includes fonts such as Arial and Verdana. Choose fonts based on their legibility, and avoid using several types of fonts mixed together or very narrow or decorative fonts.

Type weight refers to the thickness of the letters. Many typefaces are available in light or narrow or bold or extra bold. While boldfaced text appears larger, readability can decrease if all of your text is bold. Use bold to emphasize a title or a key word.

Spacing (leading and kerning) refers to the space between the letter and lines. Additional space between paragraphs and sections within a document can provide the eye breathing room. Avoid reduced kerning, or condensed spacing. Conversely an extra point or two of leading will help improve readability.

Use of all capital letters decreases readability. While there is a need to delineate content from headings, the use of all caps tends to lead to higher levels of eye fatigue because of little differentiation between the letters. As an alternative, consider using bold or capitalize the first letter of each word in a heading. This provides contract from the body copy, will increased

readability. For example "A Guide for Effective Web Design for Users of All Ages" vs. "A GUIDE FOR EFFECTIVE WEB DESIGN FOR USERS OF ALL AGES".

General Usability

- **Most importantly**, test your pages as much as possible. Visit your site from many different perspectives including computer types, different browsers and monitor displays. See how your site looks when it prints. Often color may look great on screen, but becomes ineffective when printed in black and white or with a lower resolution printer.

- **Modem and computer speed.** For many, access to the Internet initially is through libraries, community centers or older hand-me-up computers that tend to have slower modems. Keep this in mind when planning the size of your pages. If you have downloadable documents or videos, offer versions based on their modem speed. For example see http://www.agelight.org/Best%20Practices.htm where a video file is offered in multiple formats.

- **Date stamping** your pages lets viewers know how current your site or information is and increases their confidence in your content. Consider placing specific dates on articles, or stamping content as "New"—but only if you are going to remove and update it frequently.

- **Alt Tags** - Insure every graphic element and photo includes an "ALT tag". Take time to insure the description is concise yet descriptive, for someone who may not be able to see the image but uses a screen reader, or does not have the ability to download graphic images. For example rather then include a description of a photo like "photo of Mary Smith"; consider "Mary Smith, Manager of Senior Services, City of xyz".

- **Underline links** - Insure your links are consistently underlined to make then identifiable and so that "screen readers" can recognize them. Conversely do not underline text or headlines that are not a link.

- **Archive old articles** and features on your site, while maintaining the actual page URL. Links from your site may have been forwarded to others who may want to be able to return for research and reference. A simple "redirect" from these old links to a home page is an alternative to a user getting a message as "Page not found".

- **Search capability** within a site provides the ability to find exactly what they are looking for. As your site gets larger and you archive information and articles the importance of adding a search capability increases. Organize archives in a logical manner, by year or by topic, for example, with key words.

- **"Page *not* found" error messages and "broken links'** can be very frustrating and may be perceived that your site is not being maintained. It is recommended to try to link to sites at the highest possible level, such as a home page or top level page, as these pages tend to change less frequently. Configure all of your external links to open a new window. This indicates to the user they have moved off of your site. Conversely, keep a record of those external sites that link to your website. Weekly check these internal and external links to insure they are working.

- **Page size and download speed**. Check how long pages take to download over various modem connections and on different platforms such as PCs, Macintosh and Internet appliances or technologies. Many web authoring tools including Microsoft® FrontPage® automatically displays this information for each page.

- **Tables** - If you use tables provide an alternate, text-only version of your page. Often certain printers will not print these displayed on the monitor.

Accessibility & Disabilities

While the scope of this paper is primarily focused on general usability, it also broaches on "*accessibility*", or designing for those with disabilities. A significant benefit of accessibility design is the benefit to people of all ages and capabilities. This is not unlike "curb cuts" in sidewalks, which benefit not only those in wheel chairs but families with strollers, delivery persons and bicyclists.

For those users with severe vision impairments or blindness, text only sites are essential for use by brail readers or voice synthesizers. While vision is the most significant disability impacting the greatest number of users, (as the nature of a Graphic User Interface GUI), one can not forget that for others, simple usage of the keyboard and mouse can be limiting or impossible as the result normal aging such as arthritis or spinal injuries. Future advances in speech recognition on the near term horizon, offer significant promise for the disability community.

Microsoft has also added features to Windows 98, Windows 2000 and to Microsoft Internet Explorer for additional customization. This offers compatibility with assistive devices, such as screen and brail readers. To configure your Windows based computer for Accessibility options you may find these options under "Settings", selecting "Control Panel" and click on the Accessibility icon. (Note if the icon is not visible, you will need to add the Accessibility components by clicking on the "Add/Remove Program" icon and click on the "Windows set up" tab. Select the Accessibility icon. *(Note you may need your Windows 98 / Windows 2000 CD).*[13]

[13] For information on Microsoft products visit www.microsoft.com/enable. For information for the Apple Macintosh, visit www.apple.com.

User Education and Awareness

Customization, Software and Peripheral Upgrades - Many computer users are unaware of the level of customization available with their computer and software including new pointing devices such a trackball type mice, ergonomic keyboards, and the new digital mouse with the "track wheel". Replacing ones standard mouse often provides a significant improvement of curser control. Eyestrain and "dry-eyes" are a common complaint of computer users. Upgrading from a fifteen-inch monitor to a seventeen or nineteen-inch display is highly recommended. Monitor prices as well as their respective space requirements (depth of the monitor) have dropped dramatically over the past 12 months. Check your operating system (Microsoft, Apple, and Linux) and browner software company web sites (Microsoft, Netscape, AOL…) for updates and downloads, as they often have usability upgrades at no-charge. Such upgrades can significantly reduce eye fatigue, enhancing the overall computing experience. Make a conscious effort to "refresh" or rewet one's eyes with deliberate blinking. Closing ones eyes for 3 to 5 seconds rewets the eye and reduces eyestrain.

Browser Customization - Both the Netscape Navigator and Microsoft Internet Explorer allow users a high level of customization. For users of Microsoft's Internet Explores such adjustments may be found under "Tools" and select "Internet Options" and the "Advanced tab". To change and modify the font size, select "View" on the main tool bar and select "Text Size". For general changes to fonts, icons and color preference on Windows 98 and Windows 2000, on the "Start menu" go the "Settings" and "Control Panel". Within the control panel you may select several options including;

- Resizing the cursor and selecting curser displays
- Modify mouse controls, pointer display, trails as well as selecting the including single-click control option. (*Note using the single click option on both the Windows and Macintosh operating system offers simplified use for all users as well as those with eye-hand coordination and mobility impairments common with arthritis).*
- Set browser preferences such as default colors, fonts and backgrounds.
- Resize icons and fonts

Additional Resources

- AgeLight www.agelight.com
- US Administration on Aging Resources – www.aoa.gov/webresources/default.htm
- The United Nations. "United Nations Principles for Older Persons"– www.un.org/esa/socdev/iyop/iyoppop.htm
- Usability Guidelines from the National Cancer Institute – www.usability.gov
- Deborah Cloud. "The Medium and the Message," American Association of Homes and Services for the Aging, 1996
- HTML Writers Guild's Accessible Web Authoring Resources and Education (AWARE) -
- http://aware.hwg.org/

- WebTV Developer Site – http://developer.webtv.net/
- Patrick J. Lynch and Sarah Horton. "Basic Design Principles for Creating Web Sites"
- Samu Mielonen. "Colour Blindness and Link Colours," 1996

Accessibility

- Apple Computer - http://www.apple.com/education/k12/disability/
- BOBBY – Web page accessibility validation – www.cast.org/bobby/
- IBM - http://www.austin.ibm.com/sns/index.html
- Lighthouse International – www.lighthouse.org
- Microsoft Accessibility Site – www.microsoft.com/enable/
- Sun Microsystems- http://www.sun.com/tech/access/
- Trace Research & Development Center, University of Wisconsin - Madison http://trace.wisc.edu/world/web/
- The United Nations. "Accessibility on the Internet" www.un.org/esa/socdev/disacc00.htm
- World Wide Web Consortium (W3C) Web Accessibility Initiative – www.w3.org/WAI
- ZDNet Accessibility Design http://www.zdnet.com/devhead/filters/accessibility/

Feedback

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