Technology & Generational Marketing Strategies

Interface Design Guidelines for Users of All Ages

Table of Contents

Background

This paper has been written to raise awareness of design and usability considerations for increasingly varied ages and lifestyles of computer and internet appliance users. The importance of these parameters has been heightened with the increase of worldwide longevity and the integration of the Internet into all aspects of society.

In North America at the turn of this century, the average life expectancy was just 46, 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] 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 far-reaching, and herald changes in all aspects of marketing and communications.[4,] 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.

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 the designer and web master who typically are one-third the age of the senior audience.

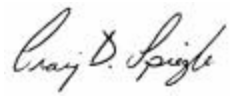
Successful businesses will be those who understand the realities of human factors for young and old alike. Understanding these dynamics will allow Internet users to realize the potential of the personal computer and the Internet becoming the most liberating technologies since the invention of the fountain pen, allowing people of all ages to enhance their community, independent living, creativity and employability.

What is usability? Effective interface usability takes into account navigability, intuitiveness, functionality and interactivity from a user perspective, rather then the perceptions of the designer, developer or organization. All too often designers, developers and product marketers fail to understand the true human factor needs. What might appear as natural and intuitive to them may be confusing to the consumer.

[1] US Census Bureau and 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*.

The first step to designing for different age segments and demographics is to understand generational perspectives. From a content perspective, consider the values of the target audiences and icons they identify with. Life and world events which connect with their youth, will posture your site and products for success. Ask yourself how will they use your product or web site? What is important to them? What devices(s) will they use? How will they be connected (dial up or broadband)? What environment will they be using it (work, home and / or travel)? What physical limitations might they have?

I encourage you to consider these needs not only for seniors and active adults, but also for our "Future Selves" and the fast approaching needs of aging "baby boomers". We must not forget that for many the Internet is a new experience. We must not champion innovation over clarity or form over function. Users who are new to technology haven't had the benefit of witnessing the evolution of site design and interactivity. Keep the cleverness where it belongs, in the content and put simplicity in the design.



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Physiological Changes of Aging

To reach this audience of consumers, web designers must understand the dynamics and the respective natural changes associated with aging. Typically these degenerative effects include diminished vision, varying degrees of hearing loss, hand eye coordination and psychomotor impairments including difficulty with small motor coordination.

Some of these are accelerated by the on-set of such degenerative diseases including arthritis, osteoporosis or stiffening of the joints, diabetes, cataracts as well as macular degeneration and optic atrophy. Others are the result of previous sports and or occupational injuries as well as strokes, all of which tend to manifest as the body ages.

Vision is the most common physiological change associated with longevity. While eyeglasses and corrective surgery can help correct nearsightedness and cataracts, 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.[5] After 55, many will experience vision changes including varying levels of presbyopia, experience a reduced field of vision and ability to resolve images. Other changes include an inability to distinguish certain colors and being able to adapt to changes in light levels as experienced when driving through a tunnel or walking out of a move theater.[6]

The most familiar ailment is presbyopia resulting in the decreasing ability to focus on near tasks such as reading as a result of the eye's lens losing its elasticity. As "boomers" age, and the usage of bifocal or trifocal corrective lenses increases, it's little wonder that eyestrain and eye fatigue associated with computer usage becomes a reality. While typically bifocals are designed for reading printed material at a distance 16" at a 25-30 degree downward angle, the average computer screen is 24" away with an upward viewing angle of 10-20 degrees. Many users with presbyopia find that a special pair of glasses optimized for computer usage resolve strain and fatigue.

Declining sensitivity as the lens yellows and increases in density from cataracts and discoloration in the eye fluids, greatly affects color perception and sensitivity in the aging eye. Yellowing of the eye lens causes images to appear as if one is looking through a yellow veil or filter. Another result 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.[7] To experience the impact, place a piece of yellow cellophane before your eyes when viewing a photograph, picture or web page.

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

Many people have a loss in color perception or degree of color blindness that accompanies their dimmed vision. Often called color blindness, as many as one in twelve males may be affected. This affliction increases with diabetes as well as glaucoma, which destroy the blood supply to the retina.[8] 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 combinations generally are not good choices for legibility. Do not assume that what you see will look the same to people with color deficits.

A third major change in the aging eye is the shrinking of the pupil, resulting in the need for more light and a diminished capacity for adjusting to changing levels of illumination. According to the American Optometric Association, a 60 and 80 year-olds retina only receives 33% and 12% respectively of the light of an average 20 year old. 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".

Other vision related changes include dry eyes as a result of declining blink rates and decreasing light sensitivity increasing the occurrence of Computer Vision Syndrome (CVS) to the older computer user. The most common symptoms of CVS are: eyestrain (sore or tired eyes), headaches, blurred near vision, blurred distance vision after near work, slowness in the changing of the focus of the eyes (distance to near and back), light sensitivity, eye irritation (burning, dryness, redness), contact lens discomfort, and neck, shoulder or back pain.

Design Considerations

Designing documents for the Web is challenging. When a reader is viewing your Web document, you have no control over the reader's platform, color depth, screen size, resolution, and window size. Different browsers can interpret HTML differently, so they will likely display the same Web document or page differently. Trying to hard code typographical controls to maintain "design integrity" will only insure that many users will not be able to use your site or product at all.

Sites often contain several usability oversights, ranging from annoying errors and awkwardness to "fatal errors" which might cause a browser to crash or computer to freeze up. These are all unacceptable and easily preventable, since the majority can be identified with simple testing, yet often they are overlooked. Some of the most common errors encountered include:

[8] Forms of color deficiencies include protanopia, (absence of red sensitivity also know as red dichromacy), protanomia (a red weakness), deuteranopia, (absence of green sensitivity), deuteranomialia, (green weakness), tritanopia (absence of blue sensitivity) and tritanomalia (blue weakness).

- Broken links, missing images or graphics, taking the user to a "The page cannot be found" error or worse to a page with little relevance to the referring subject.
- Scripting & HTML coding errors that may cause a page to not display at all. This can occur with older versions of web browsers and web authoring tools that are optimized for one browser vs. another.
- Splash screens or videos requiring the user to view them first to gain site access to the site. These self-promoting intros consume bandwidth and often can not be gracefully exited from. Second they often require plug-ins which by the nature can be obtrusive.
- Home pages which are entirely graphical or rely heavily on frames.
- Poor legibility due to small text size or illegible fonts and or low contrast between the text and background color or patterns.
- Slow page downloads due to excessive use of graphics or long pages.
- Non-titled pages or incomplete and non-descriptive titles. This causes difficulty in site searches.
- Inconsistent page layouts, menu options or navigation links that are not intuitive.

The following section provides recommendations and solutions to these site "ailments" broken down in the following sections.

1. Layout & Style
2. Color
3. Text
4. General Usability Testing
5. Accessibility & Disabilities
6. User Customization

Layout & Style

Consider a web site or interface not unlike that of a newspaper for both page layout and article length. As with a paper, place the most important information and content above the fold or in the first screen of the page as you can not expect the user to scroll down. The layout should be based on the needs of the user including the priority of the information as well as terminology and writing style of the "typical" user. We have observed older users and novices tend to scroll much slower using the bar arrows on the right hand scroll bar, vs. dragging the bar. Further hampering their navigation is the use of an older mouse which does not have a built-in scroll wheel.

Consistency on a site is essential as web users typically skim a page vs. reading the entire page. Layout consistency should include placement of logos and graphics as well as alignment (vertically and horizontally) of information and items on a page. Users prefer rows and columns on page to be aligned and, as a result, are better able to read the text.

- **Animation & graphic elements.** Flashing or blinking graphics are 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. Excessive pop-up windows and ads banners have this same impact, distracting the reader and drawing attention to everything else. With the advent of many web authoring and interface design tools such as Microsoft Front Page, there is a tendency to clutter pages with icons and graphic elements of little of no interest to the reader. Examples include page counters and awards of interest to only the designer.

- **Avoid distracting background elements**. Using any background patterns including watermarks or embossed logos generally are distracting and interfere with readability. As an alternative, a light complementary background color can be applied.

- **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.

- **Design for Internet appliances**. Today more and more people are accessing the Internet through their televisions with Internet Appliances (IA's) such as the Compaq iPAQ Pocket PC™ and the iPAQ Home Internet Appliance. 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/.

- **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.

- **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 design integrity, if a user cannot read the navigation elements, they will not be able to find the content or re-visit your site.

- **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. A user should not have to guess or maneuver the mouse to find a link. Additionally after one has viewed a link, the link color should change from the traditional blue to purple or red. Links should be descriptive, but no more then maximum of 10-12 words for site readability and quick scans.

- **Page length.** Short pages, those containing one or two screens of text, work well for the home page and menu pages when users are scanning for informational links. Longer pages, although they require more scrolling, may work well for destination pages where related content can be printed and read/scanned together. Avoid creating large pages with multiple articles and links. Break topics down into succinct pages for usability and printing. One larger master document may result in users having to print out excessive amounts of material just to get the paragraph they're interested. Additional pages and articles should be kept smaller then 30,000 bytes in order to achieve a download time of 10 seconds using a standard modem. Larger page sizes will increase users' wait time and frustration.

- **Navigation bars & links**. Consistency in navigation is one of the golden rules for all designers. Redundancy of links both within a site and on your navigation bars, (horizontal and vertical) are helpful as users explore and learn differently.

- **Paragraph alignment**. Left-hand alignment as used in this document, offers a high level of readability as compared to justification. Justified paragraphs have all lines the same length. Forcing the line length causes irregular letter and word spacing. Centered text is best used for titles or very small amounts of copy within a text box.

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

Color

Color is a critical consideration in web and interface design. Partial sight, aging and congenital color defects all produce changes in perception that reduce the visual effectiveness of certain color combinations. Two colors that may appear to contrast sharply to someone with normal vision may be indistinguishable to a user with a vision impairment. As discussed earlier, such loss of color perception and color deficiencies are more wide-spread then most people realize.

As a guideline and basic principle, one should first design in black and white, and add color for emphasis when your design is complete. Start with distinguishing which features that a user must be able to see to interact with, and then consider those features that would be nice to see. Not only do these recommendations apply to text, but also to graphics including bar charts and graphs. As an alternative to only using color, consider adding a texture or shading to differentiate data. This will insure readability of your data both online and when printed.

To help make effective color choice which work for everyone, it helps to understand three perceptual aspects of color: including hue, lightness and saturation.[9,10] *Hue* identifies specific colors, such as blue, green, yellow, red and purple. Color deficiencies make it difficult to discriminate between colors of similar hue. *Lightness* corresponds to how much light appears to be reflected from a surface in relation to nearby surfaces. If you lighten your light colors and darken your dark colors, you will increase the visual accessibility of your design. *Saturation* is the measure of a color's intensity. A pure color has no 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. With color deficits, the ability to discriminate color on the basis of these three attributes is greatly reduced and designers can compensate by insuring colors differ dramatically.

- **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. Complementary colors are opposite each other and provide contrast for readability. For example when choosing a primary color such as blue, its complementary color would be yellow. Adjacent colors to avoid would be orange and red or blue and green as they do not offer a high level of differentiation to the aging eye. An alternative choose colors from opposite side of the color wheel.

- **Colors to avoid**. There has been much discussion on right and wrong colors. A safe approach is to keep colors bright and bold. It is usually in the low saturation levels (very pale or very dark) that cause difficulties for users with color deficiencies. Colors that are exceptionally bright, fluorescence or vibrant can have edges that appear to blur and create after-images, which fatigue the eye. For example yellow text is very difficult to read. A light type color on a dark background can cause letters to 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 in these areas. A third issue is the use of color on color such as blue and red next to each other where the border edge appears to be popping. The safest colors to use are black, white, blue and yellow where as red, green brown, grey and purple can be troublesome.

[9] See Lighthouse International's site for more information http://www.lighthouse.org/color_contrast.htm.
[10] See "Can Color Blind User See Your Site" from Microsoft published October 2000. http://msdn.microsoft.com/library/default and enter "Color Blind" for the article search.

In addition to the above considerations, do not use instructions which refer to objects by color. For example rather then telling the user to click on the red or green button, tell them to press the "on" or "stop" button.

- **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.

Text

- **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 be difficult to decipher. Use consistent typefaces and fonts throughout your site by applying style sheets, pre-setting formatting in body text, header, bullet 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**. Typefaces come in two general categories serif and san serif. Serif faces 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 typefaces based on their familiarity and legibility.

- **Type weight**. The thickness or weight of the typeface. Many typefaces are available in family sets: light, bold, italic, condensed and extra bold. While boldfaced text appears larger, readability may decrease. Limiting the use of **bold** to emphasize a title or a key word is recommended.

- **Kerning.** Kerning refers to the adjustment of space between letters in a word. A designer can specify tight, regular or loose letter spacing to be applied throughout a design or style sheet. Specific adjustments can be made between letters to enhance legibility. For example, the space between a capital A and lower case letters often needs to be kerned to make the space smaller.

- **Leading.** The space between each line of text. Typically, the leading specified is 2 points larger than the typeface. Tight leading may cause legibility problems. Loose leading may bring benefits by creating breathing room and improve readability.

- **Use of all capital letters**. 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 contrast 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 & Testing

Make no assumptions on how the user of consumer may be using your site, what their Internet bandwidth is or the lighting and ergonomics in their home or office environment. It is a good idea to periodically test your site with previous versions of popular browsers. Sites tend to evolve on their own, with increased content and navigational complexity. Develop a standardized usability and performance test and track user behavior on a frequent basis. This test should also include metrics on server performance. With this data you will be able to validate design prototypes and insure continual site refinements, meet your customers needs.

- **Most importantly**, test your pages as much as possible, from many different perspectives including computer types, browsers and monitor displays and resolutions. Typically designing for an 800 x 600 resolution will insure the greatest degree of monitor compatibility. According to a study by the National Cancer Institute, about 40% of users use 17-inch monitors; 26% use smaller monitors (including laptops); and 34% use larger monitors. See how your site looks when it prints. Often colors may look great on screen, but become ineffective when printed in black and white or with a lower resolution printer.

- **Connectivity & modem speed.** For many access to the Internet is through older computers that tend to have slower dial-up modems and capacity limited Internet Service Providers (ISP's). In North American, sixty percent of users have a modem rated at 56 kbps or less, with actual connection averaging less than 34 kbps. If you have downloadable documents or videos, offer versions based on their connectivity. For example see the following link where a video is offered in multiple formats www.agelight.com/Profiles/intergenerational.htm.

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

- **Alt Tags**. Insure every graphic element, logo and photo includes an "ALT tag", using alt= "...". Insure the description is concise yet descriptive, for someone who may not be able to see the image but uses a screen reader or voice synthesis browser, 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 Community Services, City of xyz".

- **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 "The page cannot be found".

- **Search capability** within a site provides the ability to find exactly what the user is looking for. As your site gets larger, the importance of adding a search capability increases. Organize archives in a logical manner, by year or by topic, and with key words. It is recommended you include "Boolean" search instructions to improve the user's ability to find the content they are looking for. For an example see www.agelight.com/search.htm. This page includes examples using a query language from arbitrary Boolean expressions.

- **About Us.** The About Us section of your site is important to the older computer and Internet users as they are often concerned of potential information and privacy misuse. We recommend adding content and background information of the site including the management's team bios, phone numbers and street address. Instill confidence further by joining organizations such as the Better Business Bureau (BBB) and TRUSTe.[11]

- **"The page cannot be found" error message** 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. Conversely, keep a record of external sites that link to your site. Monthly, check your external links to insure they are working or if the sites and content have changed.

- **External links opening new browser windows**. Often web designers configure external links to open a new browser window. This practice has pros and cons, as it forces the user to close separate browser windows manually, in effect "disabling" the back arrow. On the other hand this communicates to the user the content they are viewing is external to the site, and tends to increase site stickiness vs. the user getting lost through a series of external links. Remember who you are designing for.

[11] TRUSTe – www.truste.org

- **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. Many web authoring tools including Microsoft® FrontPage® automatically displays this information for each page.

- **Tables & frames**. If you use tables, provide an alternate text-only version of your page, insuring tabbing will take the user to the next table field. If you use frames test to make sure your site works well without them.

- **Proprietary tags & scripting.** If you use them, provide an alternative so users may still be able to realize your site functionality and usage. With an increased concern about viruses, users are becoming more apprehensive of plug-ins and downloads. Consider these as site enhancements vs. requirements, understanding for many they can be annoying and intimidating.

- **Language, reading level & terminology.** Often content which is being repurposed for the web has been written at a literacy level greater then the general population. A good example is content found on health and financial planning sites. Many consumer sites are now adding Spanish, recognizing the growth of Hispanic web users.

Accessibility & Disabilities

While the scope of this paper is focused on general usability, due to the physiological aspects of aging, it broaches on *accessibility*, or designing for those with disabilities. Accessibility refers to whether or not the technology allows end-users to make use of the technology. Just as technology skills and relevant content are integral components to bridging the digital divide for young and old, accessible design for people with disabilities is essential to making the Internet truly universal. 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 versions of sites are essential for use by Braille 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 of normal aging such as arthritis or spinal injuries. Future advances in speech for command interfaces and speech recognition offer significant promise for the disability community.

Many industry leaders such as Microsoft and Compaq have created company wide Accessibility initiatives to improve the functionality of their products as well those of third party products and peripherals. Microsoft has added features to Windows XP and to Microsoft Internet Explorer 6.0 for additional customization. For more information on customizing your Windows based computer for these Accessibility options, go to the Start Menu, select Settings, Control Panel and click on the Accessibility icon.[12]

User Customization

Customization, software and peripheral upgrades. Many computer users are unaware of the customization available including display colors, contrast, icon size and typefaces. Additionally, affordable new pointing devices such as trackball mice, ergonomic keyboards, and the new digital mouse with the track wheel are readily available. Replacing a 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 or a LCD display is recommended to enhance usability. Over the past year, prices on these have dropped dramatically, while new designs are more compact, lighter and reduce electrical consumption.

Check your operating system and browser web sites for updates and downloads, as they often have usability upgrades at no-charge. Such upgrades can significantly reduce eye fatigue. 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 helps to 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 Explorer 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, Windows 2000 and Windows XP, click on the Start Menu, 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.*
- Set browser preferences such as default colors, fonts and backgrounds.
- Resize icons and fonts.

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

Conclusion

Our aging society and those disabled are at risk of being disenfranchised in many ways, including the potential of quality-of-life enhancing technologies, we often take for granted. The recommendations outlined in this paper are not onerous, but do take the continued awareness and participation of many groups on several levels on interaction. Concurrently designers need to be cognizant of the varied levels of adult literacy and the primary language of the intended user.

Government agencies, non-profits and corporations should engage in collaborative research on the needs of multimedia and Web technology development that would support increased usability. This research would go a long way in developing awareness and highlighting innovative market solutions for users of all ages and physical capabilities.

The recommendations in this paper reflect the findings of dozens of focus groups, user feedback and collaboration with many organizations, practitioners and researchers in the fields of usability, human factors and aging. Special thanks to the numerous individuals and organizations for their assistance; including AARP, American Association of Community Colleges, American Association of Homes and Services for the Aging, American Society on Aging, Compaq Computer Corporation, Microsoft Accessibility and Disabilities Group, the United States Administration on Aging and the United States Senate Special Committee on Aging, ranking member Idaho Senator Larry Craig and his staff.

For updates of this paper visit www.agelight.com/humanfactors/humanfactors.htm. We welcome your input and suggestions. Send your comments to info@agelight.com or write to AgeLight, 9057 Points Drive NE, Clyde Hill, WA 98004-1611. We can also be reached Monday through Friday, between 9:00 AM and 4:00 PM, PST at 425-455-8277.

Additional Resources

The following have been provided as a partial listing of resources.

- Adobe Corporation – www.adobe.com
- AgeLight www.agelight.com
- US Government "Method for Designing Usable Web Sites". www.Usability.gov
- US Administration on Aging Resources – www.aoa.gov/webresources/default.htm
- HTML Writers Guild's Accessible Web Authoring Resources and Education (AWARE) -
- http://aware.hwg.org/
- WebTV Developer Site – http://developer.webtv.net/
- Trace Research & Development Center, Designing a More Usable World - for All http://trace.wisc.edu/world/
- Microsoft Corporation – Can Color Blind Users See Your Site http://msdn.microsoft.com/library/default.asp
- www.SiteUsability.com – Improving the web experience

Accessibility

- Apple Computer "People with Special Needs" www.apple.com/education/k12/disability/
- BOBBY – Web page accessibility validation – www.cast.org/bobby/
- Compaq Computer Corporation - www.compaq.com/accessibility/
- IBM "Accessibility Center"- www.austin.ibm.com/sns/index.html
- Lighthouse International – www.lighthouse.org, Also see Lighthouse Aging & Vision newsletter www.lighthouse.org/aging&vision/aging&vision_home.htm
- Microsoft Accessibility Site – www.microsoft.com/enable/
- Sun Microsystems Accessibility Program - www.sun.com/tech/access/
- 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 www.zdnet.com/devhead/filters/accessibility/