

# A Study of Web Accessibility Barriers for Older Adults, and Heuristics Evaluation of Email Websites Based on Web Accessibility Heuristics for Older Adults by AARP

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## ABSTRACT

As people live longer and adults are increasingly using the web, it has become an increasingly important social factor to make website accessible for the older adults as many of their works are done through internet including to be in touch with their children, grand children, friends and colleagues, for online shopping of groceries and other important items, for acquiring knowledge of their health issues and so on.

United Nations has estimated that 20 % of the overall world population will be above 60 years of age by 2050[1]. The report, An Ageing World: 2008 anticipates that within the upcoming 30 years older adults population is projected to become double 506 million in 2008 to 1.3 billion, which will be the increment from 7 % to 14% of the aged population. [12]

This rapidly increasing population of older adults over the web is not taken into consideration by web developers while designing websites that is they don't make accessible websites for older adults.

There are significant web accessibility barriers for people with disabilities including older adults who face many accessibility problems while accessing websites including vision impairments, hearing impairments, psychological hindrances, motor impairments, mental model inaccuracy, decline in learn-ability and memorability.

Due to these barriers older adults find significant problems in accessing the web. For example the use of mouse, double clicking, using scrollbars and absence of a proper website navigation for older adults, the use of font family and sizes which are not legible for older adults having vision impairments or weak eye sight, for blind older adults the top to bottom logical order of tables or improper use of heading tags may create accessibility barriers.

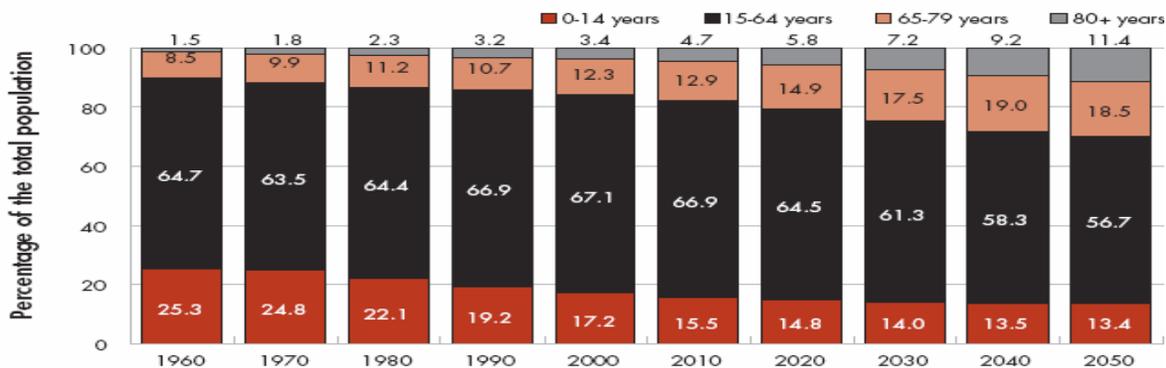
This paper discusses these accessibility barriers faced by older adults in accessing websites. Furthermore it presents an expert analysis of Gmail, Hotmail and Yahoo mail accessibility problems based on WAI AGE guidelines (Web Accessibility Guidelines for older adults by W3C) and heuristics evaluation based on AARP heuristics.

**Keywords:** Web Accessibility, Older Adults, Ageing, Barriers, Perceived Ease of Use

## 1. INTRODUCTION

The United Nations has estimated that 20 % of the overall world population will be above 60 years of age by 2050. The report, An Ageing World: 2008 anticipates that within the upcoming 30 years is projected to become double 506 million in 2008 to 1.3 billion, which will be the increment from 7 % to 14% of the aged population.

This rapidly increasing population of older adults over the web is not taken into consideration by designers while designing websites. Older adults face many accessibility problems while accessing websites including vision impairments, hearing impairments, psychological hindrances, motor impairments, mental model inaccuracy decline in learn-ability and memorability. These accessibility problems are called the age-related-functional-limitations.



**Fig 1:** Population structure by age (1960 to 2050) [1]

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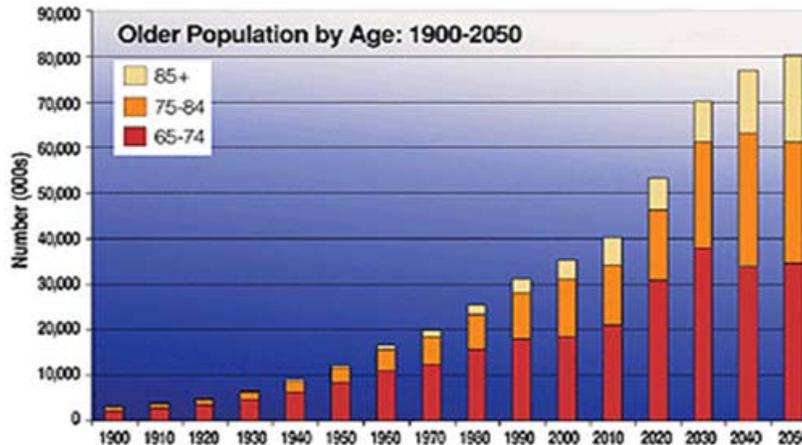


Fig 2: The above graph indicating the increment in 65 + no. of people [2]

## 2. AGE RELATED FUNCTIONAL LIMITATIONS

According to W3C following are the most commonly accepted age related functional limitations that often take place during the ageing process [3]:

1. Vision decline
2. Hearing loss
3. Motor skill diminishment
4. Cognition decline with age

The elderly people can also be affected by other functional limitations occurring as a result of the ageing process.

### 2.1 VISION DECLINE:

As it is quite commonly noticed that eye sight weakens due the ageing process which includes both the diminishment of vision farther or nearer; the other visual impairments which are not taken into consideration by designers are [3]:

#### 2.1.1 Colour Perception and Sensitivity:

According to this visual impairment, less violet is noticeable and distinguishable, i.e. red and yellows are clearly seen as compared to darker blues and greens and often darker blues and black become indistinguishable.

#### 2.1.2 Contrast Sensitivity:

From the age of 40, contrast sensitivity at higher spatial frequencies starts to decline till the age of 80. At this age it has been reduced by up to 83%.

Besides these there are other visual impairments as well which can affect the older adults' accessibility.

Assistive technologies (the technological solutions for older adults' age related functional limitations) used by older adults with visual impairments are Screen readers and in case of complete blindness Screen Magnifiers are used. That is multi-modal systems (Systems providing information in more than one modes.) are used to assist complete blind people to access the web that if they cannot see the information they can access it by listening to it.

#### 2.1.3 Pupil Shrinkage:

It results in more need for light, diminished capability to adjust to light with changing levels.

#### 2.1.1 Hearing Loss with Age:

Hearing loss is also an important factor in web accessibility for older adults. It increases with age and in some cases can even lead to complete deafness. Hearing loss can be treated in some cases but in some cases it becomes permanent. It can lead to frustration in older adults. For e.g. if an older users having visual impairment is watching and listening to a tutorial he/she will not be able to understand it fully. It can even make it difficult for him/her to understand to an online doctor for an online treatment. [6]

Mortensen & Moller [2007], for example, reported that between 3.8% and 6.8% of people over the age of 80 suffer from high levels of both vision and hearing loss. [8]

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More than 50% of Canadians with over 65 years of age have some levels of hearing loss (Public Health Agency of Canada, 2006). Hearing is not usually required for web browsing, but as websites become fancier each day, multimedia (video, audio, animation) content increases. These websites are more interesting and attractive, but the multimedia content can also be the barrier to people who have hearing impairments [9].

Assistive technologies used for hearing impairments are the devices which can help them in listening to the sound clearly. In case of complete deafness videos, audios and images can be accessed by the use of text based captions. Like in complete blindness case multi-modal systems are also used in complete deafness cases i.e. if the user cannot hear it he/she can access it by seeing and reading it.

## 2.2 MOTOR SKILL DIMINISHMENT:

With the increase in age the motor skills i.e. the ability to move body parts become diminished. Decline in motor skill includes slower response time and inflexibility of movements (Kurniawan and Zaphiris: 102) [9].

Due to motor impairments older adults face problems in operating keyboard which includes typing, using mouse including moving mouse, scrolling and clicking, using touch screen which includes clicking, scrolling and typing [10].

Arthritis and Parkinson are one of the main reasons of the motor skills diminishment. According to Wikipedia reports Arthritis causes major mobility issues for older adults. As far as Parkinson's disease is concerned, it causes the patient in continuous trembling or shivering of one or more body parts including hands, arms, legs, feet, jaws and face. It affects the writing, speaking, specially the moving of the affected body part due to Parkinson's disease. It can also cause the postural imbalance in the patient. [3] Both Parkinson's disease and Arthritis cause the older adults issues in using mouse keyboard, joystick and touch screens.

In the extreme cases of hand use impairment feet are used for using assistive technologies. In most extreme cases of motor skill diminishment even tongues are used to give input to and obtain output from these technologies.

## 2.3 COGNITIVE DECLINE WITH AGE:

Decline in the cognitive abilities is a natural phenomenon in the ageing process. Cognition generally means the process of awareness and thought. It involves several aspects including perception, recognition, reasoning, memory and learning [9]. Learnability and memorability is quite important in accomplishing the computer related tasks [9].

The learnability and memorability of a younger adult is significantly higher as compared to an older adult [11]. Older adults due to declined cognitive skills process and understand information slowly and take time to perform the task. Another reason behind that is that the older adults feel less confidence while using computer or even any device. They have the fear in them that things can go wrong and the device they are using can become out of order. The problem with cognitive decline is that the assistive technologies like in other age-related-functional-limitations Can't help the older adults as such to acquire the correct mental model and be able to learn and memorize computer related tasks.

For this purpose the information should be presented in a simple manner that the older adults can access the website without the need of taking assistance from other to learn using it. The design of the website should be intuitive and predictive to an older adult.

Another possible solution to cognitive complexities of older adults is the availability of a proper help and user guide. Information presented with simple and usable guide and help can help older adults significantly. Tutorials can also be of great help to them in this regard.

Another solution which can involve older adults greatly is the presentation of help and complex information by adding fun to it. As older adults feel it difficult to change settings option in any website, this can be taught to them in the form of a game or in a graphical manner that can be quickly grabbed by them. For example how would an older adult understand that “**Always use https**” option is important for their security? This can be taught in an easy graphical manner that can be grabbed easily and quickly.

## 3. ANALYSIS OF GMAIL, HOTMAIL AND YAHOOMAIL ON THE BASIS OF AARP HEURISTICS

Gmail, Hotmail and Yahoo mail are three very important giants in the mail sector of websites. As older adults use mail services a lot for doing mails to their colleagues, friends, children and grand children, the compliance of these mail service providing websites to web accessibility heuristics is very important. The web accessibility heuristics for older adults were identified by AARP in 2004 but these heuristics are still considered very important and W3C's WAI-AGE also recognizes the AARP heuristics.

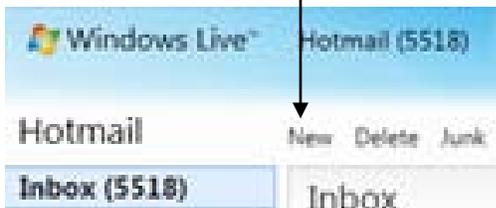
However these three websites follow many of these heuristics there are some which have not been followed by all three in some cases which are discussed below:

1. **Are command and action items presented as buttons?**

## 2. Do button and link labels start with action words?

The above heuristics have only been followed by gmail. Neither Yahoo mail nor Hotmail comply with this heuristic:

Instead of “New”, “Compose Mail” is quite understandable. However Yahoo Mail has changed the Mail Creation option in its new version from “New” to “Compose Message”.



3. Do graphic buttons avoid symbols that will be unfamiliar to older adults who have low computer and Web expertise?
4. Are clickable items highlighted differently from other non-clickable highlighted items?

Previous Gmail's Settings Graphical Button does not follow both the above heuristics



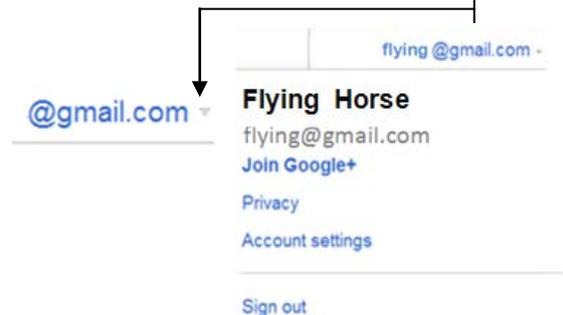
This iconic button cannot be recognized by even every young adult. It is very much possible that this button is not considered as a clickable button but interpreted as an image or part of the design of the website by the older adults.

More over when this button is clicked two very important options specially the help option is hidden and will appear on the click of this graphical button which causes a visibility problem of the help button.

Furthermore this settings button does not indicate that it is clickable.

However this problem has been resolved in the New Gmail Version but there are many users specially the older adults who when learn something and become used of it are very less likely to switch to a new version of a software or a website. As already discussed above older adults have quite a slower learnability and are resistant in adapting changes in computer softwares specially.

The same visibility issue is raised by the following Gmail's option both in previous and new versions that beside the username, a very small triangle is there on the click of which sign out and other options shown otherwise hidden. The sign out option should not be hidden inside. It should be visible clearly.



Both the triangle and options button have a visible change on mouse over in Previous Gmail Version but without pointing on both of them one cannot predict that both of them are clickable.

However in New Gmail version there is no visible change on mouse over on the triangle that is it does not indicate that it is clickable.

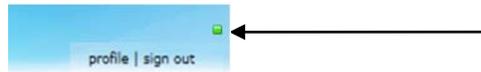
In the same way the left pane of New Gmail Version, where Gmail is written with red colour and a small red triangle is there as well has neither any visible change on mouse over and nor it indicates that its clickable.

Furthermore on clicking Gmail, three very important options are displayed which otherwise remain hidden creating a visibility problem for older adults. That is if older adults switch to New Gmail, and they want to add a contact, make a task list and perform other related tasks, it would be quite difficult for them to be able to do it themselves. This would lead them to take assistance from others resulting in

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switching back to the Previous Gmail Version where these options could be clearly viewed.

Same is the case with hotmail's green or red or white coloured button indicating the chat status.

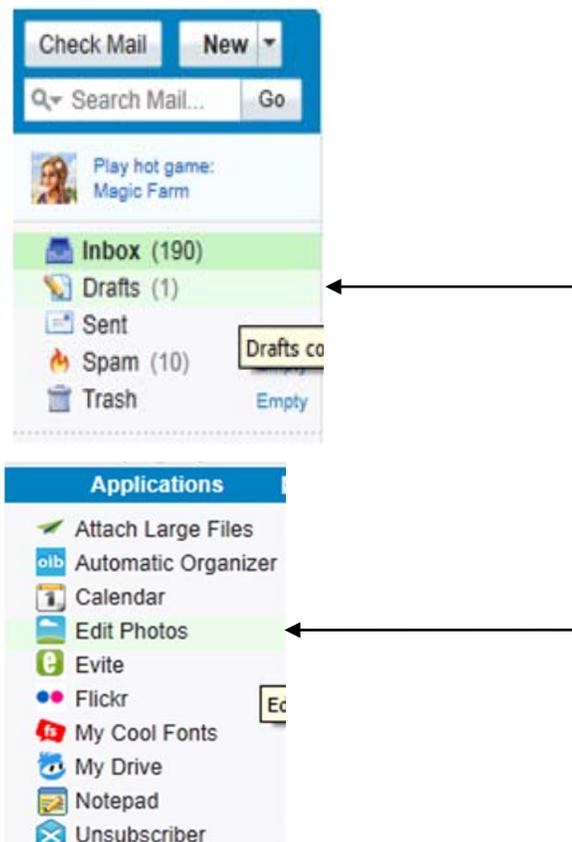


It does not indicate that it is clickable and it does not even indicate that it is a chat status. On mouse over its options open automatically and then one comes to know that this green sign is actually a button showing the chat status.

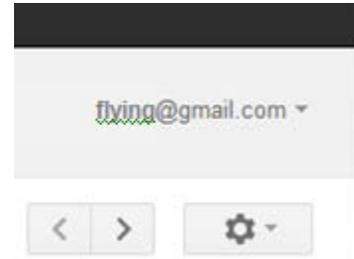
This is a visibility problem as well because if one does not know where chat options are, he/she instead of finding it himself/herself will have to take assistance from other(s) to help them do this.

**5. Is there a visible change (other than the cursor changing) when the user “points” to something clickable with his or her mouse?**

In the left pane of Previous Yahoo Mail on mouser over the colour is changed but is not very clearly visible. It's even a little less noticeable by the young adults.



As far as the older adults are concerned who face problems like the Contrast Sensitivity will more likely not notice that. Furthermore it does not follow the following heuristic.



Secondly on the top right corner of new gmail, where the small triangle and the user id are displayed have no visual change on mouse over. That is there should have been a proper title text indicating the user actions that can be performed after clicking it.

**6. Is link treatment the same from section to section within the site?**

In Previous Yahoo Version the other links on the page are underlined on mouse over and the colour is different from the rest of the paragraphs' or line's font the link is in.

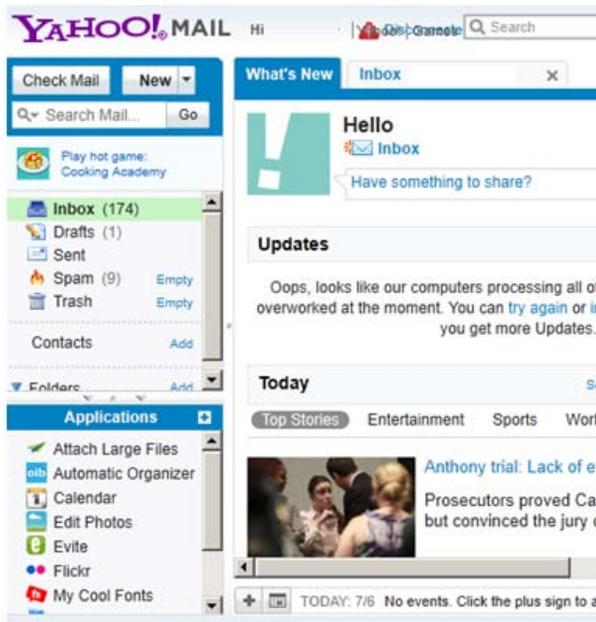
**4. INCOMPLIANCE WITH AN IMPORTANT WAI-AGE GUIDELINE:**

**4.1 Provide text size adjustment link**

By none of the gmail, hotmail and yahoo mail this guideline has been followed. It is very important to provide a text adjustment link for older adults at a clearly visible and easily noticeable position especially on the websites whose target audiences are either older adults or for the websites targeted for all age groups:

**5. OTHER ISSUES:**

1. On Window resize the Sign-out and chat options overlap in **Previous Yahoo Mail Version**.



2. If a user uses **black and white theme** and then accesses Yahoo mail, the email account will be displayed as follows:



Hotmail will be displayed as follows on black and white operating system theme:

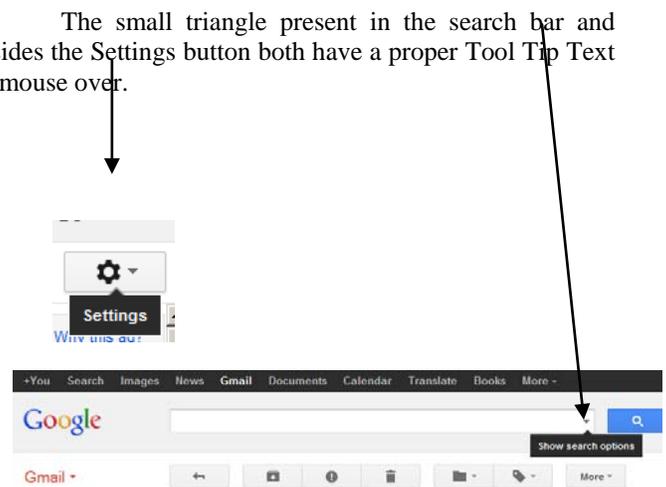


Gmail however looks fine when accessed with black on white theme of OS.

Here only those parts have been highlighted for both yahoo mail and hotmail which can create a bad visual impression and an accessibility problem for older adults accessing these websites with black on white theme of an OS. Here the screen shots of Windows 7 have been presented.

### 3. Internal Inconsistency for Tool Tip Text of Clickable Items.

The small triangle present in the search bar and besides the Settings button both have a proper Tool Tip Text on mouse over.



There should be a proper usage of the Tool Tip Text through out the website as it reduces the need to take others' assistance to get the task(s) done and specially it is of great help to the older adults.



But the triangle present besides Gmail link in the left pane and besides the user id both don't have any Tool Tip Text provided.

## 6. SUMMARY:

Guidelines / Heuristics / Other Issues	Yahoo mail	Gmail	Hotmail
1. Are command and action items presented as buttons? (AARP)	x	✓	x
2. Do button and link labels start with action words? (AARP)	x	✓	x
3. Are clickable items highlighted differently from other non-clickable highlighted items? (AARP)	–	x	x
4. Do graphic buttons avoid symbols that will be unfamiliar to older adults who have low computer and Web expertise? (AARP)	–	x	x
5. Is there a visible change (other than the cursor changing) when the user “points” to something clickable with his or her mouse? (AARP)	x	–	–
6. Is link treatment the same from section to section within the site? (AARP)	x	–	–
7. Provide text size adjustment link. (WAI-AGE)	x	x	x
8. On Window resize the look and feel should be the same or should not give a bad visual impression. (Other Issues)	x	✓	✓
9. The email accounts should give a reasonably good visual impression on all themes of all OSs. (Other Issues)	x	x	✓
10. Internal inconsistency for Tool Tip Text of Clickable Items	–	x	–

## 7. FUTURE ENHANCEMENT

The future enhancements can be made regarding researches for older adults on different types of websites including health, social networking sites and shopping websites etc based on web accessibility guidelines for older adults or some enhanced heuristics evaluation.

Further researches for these websites and the ones mostly used by older adults can be made in the light of the Technology Acceptance Model (TAM) - an information systems theory that models how users come to accept and use a technology [13].

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## 8. CONCLUSION

The older adults face diverse accessibility problems while accessing the web. They have the most diverse characteristics to be taken into consideration for the accessibility of websites. This requires for more attention towards meeting the web accessibility standards for older adults. It also requires diverse testing for meeting the web accessibility standards for older adults including different.

Operating Systems themes with different versions on different screen resolutions, different versions of browsers, different versions of websites themselves like in the case of Yahoo Mail, Yahoo Mail Classic, New Yahoo Mail and the upgraded Yahoo Mail and Yahoo Mail Plus all must be tested with all the OSs, all the browsers and specially all the assistive technologies.

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