Usability Study

Usability Preconditions

Deliverable 3.2 (version 2)

07/03/2012

Version	Comments	Authors
V1	First version of the document. We focused on a general analysis of disability and ageing, and the description of some recommendations grouped by: disability (visual, motor, hearing or cognitive) forms and personalization.	Ricard Barberà (IBV) Katja Popp (SKW)
V1.2	This version includes some minor modifications of version 1, relative to the references. The most important modification is the addition of recommendations for physical elements of the system.	Ricard Barberà (IBV)
V2	Two new annexes have been added concerning usability criteria for tablet PC and design criteria for web sites. In addition the SIMPLIT approach has been explained.	Ricard Barberà (IBV)

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Main focus and objectives:

The objective of this document is to include the main usability criteria related to the elisa system that should be considered in both, the design and the evaluation process.

This deliverable is split in 3, according to the DoW, the next part will be presented in month 23 (30/03/2012).

Integration into Project work plan:

This deliverable document is an input for WP4 and WP5. For WP4, Product & System development, giving requirements and indications in which base the design and development of the product. For WP5, Test & Evaluation giving the necessary checking aspects to ensure a good evaluation of the key aspects identified.

Deviation from description of the work (if necessary):

- This deliverable was delayed due to the delay in the whole development process of the system. This delay was informed to CMU and NCP Germany..
- No deviation in form and content from description of the work.

Main results and use value for project:

This document contains valuable information for the development and for the validation of the system. For instance, recommendations for ageing-related functional impairment for software and hardware, and a description of the SYMPLIT methodology, used by IBV to test the product usability.

Main conclusions and consequences:

Usability aspects have been gathered and analyze in order to guide the design (WP4) and testing (WP5) the system elisa.

CONTENT

1 General Introduction

This document includes the usability preconditions that will be taking in account during the testing and product development process. Recommendations for ageing-related impairments for software and hardware are presented, as well as, the SYMPLIT approach proposed by IBV. This deliverable is split in 3 parts, according to the DoW, the next part will be presented in month 23 (30/03/2012).

Aging is associated with changes in characteristics such as visual and auditory perception, fine motor control and some aspects of memory and cognition. While many of these changes are only apparent in psychological tests, some can influence participants' ability to, for example, read or hear experimental instructions, use a mouse, or remember steps through an interface (A. Dickinson et al., 2007).

The aging process affects an individual's ability to function successfully with the standard graphical user interface. In fact the facilities, which are required for this kind of interaction, are the very ones that deteriorate most markedly with age. Deteriorating visual acuity makes the interface difficult or impossible to see. Memory impairment reduces the ability to build conceptual models of the working of the interface since this activity relies on remembering sequences of actions and reasoning about them. In addition the ability to navigate successfully and build strategies deteriorates with age an aspect, which is especially important when moving from page to page in the World Wide Web environment. Manual dexterity is also affected making mouse use difficult and reducing user's confidence in tackling new situations thus promoting a reluctance to tackle new tasks.

Web and human computer interfaces (HCI) usability is also significantly poorer for older users. The reasons for these differences are likely to be found mainly in age-related cognitive change, including reduction in processing speed and working memory, and a decreased ability to ignore irrelevant or distracting information. Aging is also associated with changes in vision, including visual acuity, contrast discrimination and reduction in the efficacy of parafoveal vision; in addition, severe visual impairments become more likely with advancing age. Finally, changes in muscle strength and manual dexterity, as well as musculoskeletal disorders, mean that using a mouse is more difficult: older adults consistently perform poorly on tasks using a pointing device and, as the tasks become more difficult, for example, double-clicking, the difference between older and younger adults increases. Despite these barriers, there is little evidence that older people are particularly technophobic (Newell et al., 2006).

Besides, old people do not have experience with new technologies. Many learners would have to master keyboard skills before attempting to master the Internet. The 'qwerty' keyboard appears illogical and difficult to follow, and for many older people simply finding and pressing the keys has become a dauntingly skilled operation.

However, more and more people entering the stage of retirement at around age 55–65 are healthy, active, and also very computer-literate. This trend is rapidly changing the common image of late-mid life technology users, which rest son the assumption that they find it difficult to embrace new technologies and also that their main interests are health related. Although technology use and life styles are changing, however, many other aspects of life remain the same. One of these aspects is that of the transitions, or life changes, that generally take place in these years. Besides retirement, these transitions include changes in health, housing, social interaction, work life, and personal finance. People develop different ways of coping with these transitions, which brings up interesting issues related to the late midlife stage (Salovaara et al., 2010).

According to the Wagner's review (Wagner et al., 2010) the most common use of computers and the Internet for older adults appears to be for communication and social support. Other common uses of computers and the Internet by older adults include: leisure and entertainment, which tends to be related to offline interests and hobbies.

A recent study carried out by the Pew Research Center (http://www.pewinternet.org/Reports/2010/Older-Adults-and-Social-Media.aspx) has shown that, while social media use has grown dramatically across all age groups, older users have been especially enthusiastic over the past year about embracing new networking tools. Social networking use among internet users ages 50 and older nearly doubled—from 22% in April 2009 to 42% in May 2010. Although email continues to be the primary way that older users maintain contact with friends,

families and colleagues, many users now rely on social network platforms to help manage their daily communications—sharing links, photos, videos, news and status updates with a growing network of contacts.

The most important barrier to computer use by older adults is actually the lack of perceived benefit that is to blame. Either the technology does not meet the needs of the user, or they do not understand the technology sufficiently to appreciate the benefits.

Although designing for older people could be an extra effort, it is important to remember that designing for extremes in the population can produce better designs for everyone.

1.1 Functional Limitations / Disability

The solid distinction between able and disabled is artificial: within any real population, there is a continuum of functionality, which is also age related. Vision, for example, ranges from 20/20 vision through age-related reductions in focal range (which can be corrected by spectacles), to legal and, finally, total blindness. As we mentioned earlier, all older people have minor age-related visual impairments and, although most will not consider themselves visually impaired, they will find the use of standard screens much more difficult than they did when they were younger. Nondisabled older people tend to be overlooked as being neither able-bodied nor disabled enough to need accessibility features.

"Web accessibility" usually refers to a series of standards, mainly those produced by the W3C, and guidelines for developers. The focus has been on the production of standards-compliant sites which allow users to access the site through assistive technologies such as screen readers. While this approach has done much to enable access for the technically knowledgeable which can use assistive technologies, it is less effective in enabling access for older adults (Anna Dickinson et al., 2007).

Different studies have demonstrated that the conventional approach to accessibility (standards-compliant websites that offer the *flexibility* to enlarge text size, change color contrasts, etc.) is inappropriate for older adults, who are unlikely to take advantage of these possibilities (Anna Dickinson et al., 2007). Many accessibility features found in commercial software require significant knowledge of computers to find and install them, skills not often found in older people, and many accessibility options have very poor usability (Newell et al., 2006).

1.2 Mistakes to avoid

In order to design successfully for older people, it is not productive for designers to simply follow guidelines. They need to be made aware of the huge cultural and functionality differences between themselves and older users: they cannot design for themselves and expect the older users to find the system appropriate or usable (Newell et al., 2006).
The accessibility barriers that have a more negative effect on the daily interactions of older people with the web are due to their difficulties in remembering steps, understanding web and computer jargon and using the mouse, despite their willingness to use it. These obstacles could be much more important than those caused by their difficulties perceiving visual information, understanding icons and using the keyboard(Sayago et al., 2009).

Some common mistakes are (Newell et al., 2006)(Sayago & Blat, 2009):

- substantially too much functionality, increasing the risk of getting lost in the system, and the fear of not knowing what to do;
- complex conventions which were not understood by the users, including issues such as when to double-click;
- the use of impenetrable terminology and jargon;
- very cluttered screens which confused older people;
- icons, fonts, and color contrasts which were inadequate for those with age related sensory loss;
- memory needs that demanded far too much from people with age-related memory loss, which included information hidden within poorly-titled menu systems.

- Increasing the size of elements is bad if horizontal or vertical scroll increases too.

1.3 DESIGN RECOMMENDATIONS

The Web Accessibility Initiative (WAI) of World Wide Web Consortium (W3C) has published different accessibility guidelines, such as Web ContentAccessibility Guidelines (WCAG), guidelines for browsing and access technologies (User AgentAccessibility Guidelines - UAAG), and for tools to support creation of Web content (Authoring Tools Accessibility Guidelines – ATAG). To follow these guidelines are a good start for improving accessibility, but is not enough. There is evidence that W3C guidelines do not assure accessibility (Kelly et al., 2007).

2 RECOMMENDATIONS FOR AGEING-RELATED FUNCTIONAL IMPAIRMENTS (SOFTWARE)

In the following points we classified the different recommendations (Fisk et al., 2004; S.H. Kurniawan et al., 2006; Newell et al., 2006; NIA, s.d.; Zaphiris et al., 2007):

2.1 VISUAL

1. Generally failing vision, this necessitates the information to be presented in a larger size:
    a. Fonts and text:
        i. Use a sans serif typeface, such as Helvetica, that is not condensed. Avoid the use of serif, novelty, and decorative typefaces.
        ii. Use medium or bold face type.
        iii. Larger than average fonts for body texts: 12 to 14 point as a minimum.
        iv. Present body text in upper and lowercase letters. Use all capital letters and italics in headlines only. Reserve underlining for links.
        v. Double space all body text.
        vi. Use left justification.
        vii. Avoid moving text.
    b. Larger than average clickable targets:
        i. 32 x 26 pt
        ii. 180x22 pixels for a graphic button.
2. Reduced lens elasticity, which reduces focusing power and gives rise to a feeling of 'tired eyes':
    a. Avoid using all capital letters, all emboldened letters, and several types of fonts mixed together or very narrow or decorative fonts tends to lead to higher levels of eyestrain and eye fatigue because it does not give the eye sufficient rest.
    b. Bright and extremely vibrant colors can have edges that appear blurred, create after-images and tire the eyes; therefore, their use should be limited. An effective use of white spaces and presenting text in small blocks provides mitigation.
3. Corneal flattening which reduces the amount of light that passes into the eyes. For this reason is necessary to maximize the information/background contrast in critical content areas. Present information in the colors that are easier to see and use the colors that are more difficult to see as background:
    a. Easier to see: reds, oranges and yellows.
    b. Difficult to see: blues, greens and violets.
    c. Background screens should not be pure white or change rapidly in brightness between screens.
    d. Ensure that text and graphics are understandable when viewed on a black and white monitor.
    e. Images should have alt tags
4. Visual field reduction resulting in reduced peripheral vision: Present important information as close to the centre of the screen as possible.
5. Reduced retinal efficiency resulting in a diminished ability to adapt to glare or changing light conditions—meaning that negative polarity (light colored text on dark colored background) is likely to be more readable than a positive polarity setup in certain lighting condition. Use dark type or graphics against a light background, or white lettering on a black or dark-colored background. Avoid patterned backgrounds.
6. Older people have reduced ability to recognize figures that are embedded within other figures. A direct implication of this condition is that older people are easily distracted by background patterns, drop shadows

on text or floating text over images. The use of a faint grid pattern as background was found to provide the best compromise.

2.2 MOTOR

1. Stiffening of the joints and arthritis, which causes difficulty with finer movements and motor coordination:
    a. 'Click-and-drag' activities are extremely difficult for some older people. Provide a ClickLock setting that does not require click-and-drag.
    b. Scrolling may also prove difficult for some, but can easily be solved through considerate design:
        i. Avoid scroll bars if possible. Breaking pages into chunks of no more than one or two screens' worth of information will eliminate much of the need for scrolling.
        ii. Never provide nested scroll bars.
    c. Homing into a small target is also problematic. Large buttons and hyperlinks (or a hot area around a hyperlink) will help in this aspect, while at the same time assist people with declining vision.
2. Older people are slower in tracking and capturing a moving target with a mouse. They also tend to break movements into many sub-movements:
    a. Avoid the use of walking menus, which tend to disappear before a user can 'walk' to their sub-menus.
    b. Double-clicking mouse may be difficult. Single-clicking option or changeable double clicking speed can solve this problem.

2.3 HEARING

1. Interfaces that use sound to get the users attention will need to use lower frequency sounds for older users:
    a. It is found that a beep that sweeps across 0.5–1.0 KHz was reasonably effective.
    b. Recorded voice should also use speakers with low-pitched voices.
2. Permit the user to adjust the volume.
3. Reduce speech velocity: less than 140–180 words per minute.

2.4 COGNITIVE

1. Reduced working memory capacity causes poorer performance in a wide variety of tasks:
    a. Limit the use of deep hierarchies.
    b. Provide site maps, orientation information and navigation bars.
    c. Reduce the number of steps required in a transaction.
    d. The number of actions/buttons per screen kept to a minimum (below 10).
    e. Avoid pull down menus.
    f. There should be differentiation between visited and unvisited links.
2. Problems to learn and retain new information:
    a. Provide a simplified online tutorial or manual, which they can refer to from anywhere in a web hierarchy. The learning tasks explained in the tutorial need to be broken into subtasks.
    b. Provide context-sensitive help, reminders and FAQs to assist recall. Provide location of the current page.
    c. Write the text in simple language. Provide an online glossary of technical terms.
    d. Providing clues on how information is organized, such as providing information overview and outline is also a big help to older adults.
    e. Voice help approach could be useful where memory impairment precludes the building of strategies and experimental learning at the interface. The idea is that the user is talked through their interaction (Zajicek, 2001).
3. Reduction of perception, spatial and visual information processing meaning that older adults are slower in finding a target in a complex web page. Older people with and without previous experience placed much more importance to words than icons in their everyday interactions with the web. They find more difficult to understand and remember icons than words (Sayago & Blat, 2009).
    a. Incorporate text with the icon if possible.
    b. Written directions are better than maps.
    c. Never present information in three dimensional forms. One- or two-dimensional presentation of information is more easily comprehended.

4. Divided attention is reduced (the ability to pay attention to particular details in the presence of distracting information):
    a. Each screen to have a very clear primary function.
    b. Unless they convey important information, walking, blinking and flashing objects should be avoided.
    c. Reduce the use of tiled windows or multiple frames that compete for older adults' attention.
    d. Avoid designs effects that disconcert old people (García Gómez, 2008):
        i. Pop-up windows.
        ii. Flash videos with infinite loop.
        iii. Graphics should be relevant and not for decoration. No animation should be present.
5. Increase the chance of experiencing interference in long-term memory applying consistency when designing web pages. For example:
    a. Only using underlining for links.
    b. Clear conventions for the positions of buttons and information. Use a standard page design and the same symbols and icons throughout. Use the same set of navigation buttons in the same place on each page to move from one web page or section of the web site to another. Label each page in the same location with the name of the web site.
    c. Use explicit step-by-step navigation procedures whenever possible to ensure that people understand what follows next. Carefully label links.
    d. Incorporate buttons such as Previous Page and Next Page to allow the reader to review or move forward.

2.5 FORMS

Forms are very usual in web applications. Some guidelines from W3C are:

- Form layout – extra space between questions and answer boxes (not confirmed in the second study)
- Simplified question structure – to avoid creating 'excessive' cognitive loads
- Question completion assistance – pop-up messages and/or hyperlinked context sensitive help with each appropriate questions
- Additional information – including a list at the top of what information will be required to complete the form
- Data entry – automatic checking and validation during completion
- Form personalization – presenting only those questions appropriate to the users, e.g. a widow should not be asked for information about her spouse
- Form submission – online submission will be easy for many mobility impaired elderly people, and may lead to quicker processing time
- Bullet point instructions – easier to read than paragraph text
- Logical information groupings – to ensure that the user does not need to go back-and-forth within a form
- Justification for personal/sensitive questions – the participants resented providing some information for no apparent good reason
- Security information – how could the users be sure their data would remain confidential?
- Help and assistance feature – this second study suggested a 'formal' help page in addition to the pop-up and/or hyperlinks suggested previously
- Save and return – an advantage of paper-based forms is that you can put them down and finish completing them later; this was requested by users for online forms

2.6 PERSONALIZATION

Even though we follow accessibility guidelines, people are not able-bodied and familiar with the technology. Maybe it is possible some simple personalization to allow for people with poor eye sight or dexterity in addition to accessibility features, but they do not know how to change the configuration.

Interface layering represents a useful approach to introducing the novice computer user to available functionality (Shneiderman, 2002). Dickinson et al. (2007) propose 3 layers:

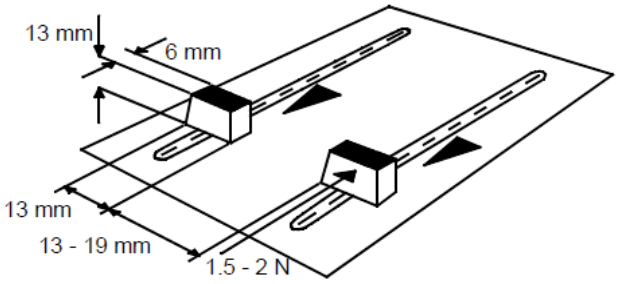
1. A “walled garden” of highly accessible core content, fully controlled by the development team, and repurposed specifically in order to introduce the user to the web.
2. A second layer that was a wider layer of content provided by third parties, but conforming to similar high standards of accessibility and navigable structures.
3. A third layer that consisted of information content from the web in general (“warts and all” content) that did not necessarily conform to accessibility standards.

2.7 EXAMPLES

ActiveOptions (http://www.activeoptions.org) is a multi-agency effort to help people remain healthy as they age by providing Web access to information about senior-friendly exercise programs (Ostergren et al., 2007).

3 RECOMMENDATIONS FOR AGEING-RELATED (SYSTEM ARCHITECTURE)

3.1 SLIDERS AND ROTARY CONTROLS



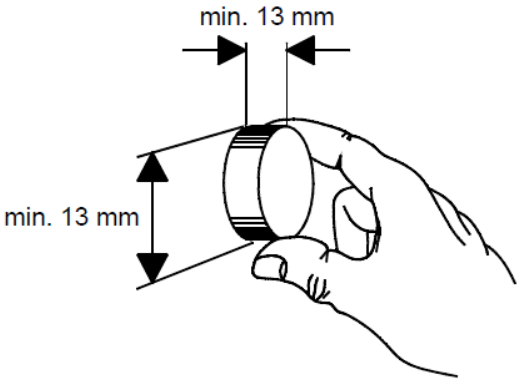
DIMENSIONING [3]

It is strongly recommended to use sliders or rotary controls.

A) SLIDER CONTROLS

Implement the slider according to established stereotypes (left and bottom is low, little, and right and up is high, much).
Provide a label/legend parallel to the direction of movement, with a wedge element to demonstrate the variable increasing; provide indicator values if required.
Use finger tip sliders with force resistance of 1.5 N to 2 N or larger sliders with force resistance of 2 N to 3 N.
Sliders for finger/thumb grasping should be a minimum of 13 mm high, 13 mm wide and 6 mm thick.

B) ROTARY CONTROLS



The direction in which the controlled variable increases should always be to the right, i.e. clockwise, and irrespective of where the control is situated.
Provide labels and legends which are parallel to the direction of motion, i.e. circular, as a wedge with the thickest part to the right. Give indicated values if required.
Provide a mark on the control to indicate the current set value if required.
If possible, it is recommended five finger grip controls.
In any case, use rotary controls with the following minimum dimensions:

- Thumb/finger grip - 13 mm diameter, 13 mm high.
  (If smaller knobs are essential, ensure that they are used only for occasional setting tasks and have minimum dimension of 6 mm diameter, 13 mm height from casework).
- Five finger grip - 25 mm to 75 mm diameter, 13 mm to 25 mm high.
- The finer the degree of control necessary, the larger the control diameter is necessary, up to the maximum for one hand (75 mm).

Use knobs with straight sides and clear serrations with sharp peaks.
Use controls with the following maximum torque requirements:

- Thumb/finger grip up to 25 mm diameter up to 0.032 Nm.
- Five finger grip greater than 25 mm diameter up to 0.042 Nm.

3.2 PUSH BOTTONS

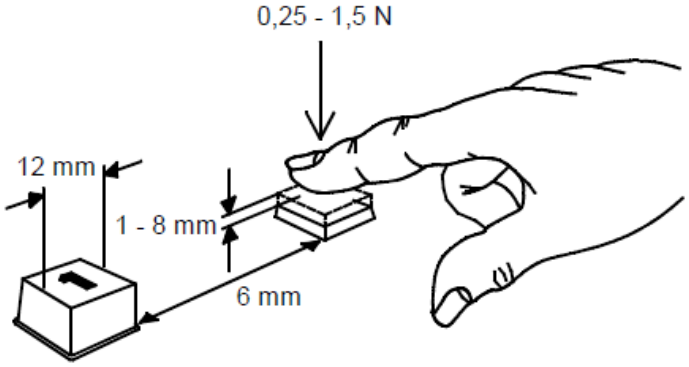
DIMENSIONING [3]

A) TYPE

1) Pushbuttons (not pressed below the surface)

Pushbuttons for finger operation which are not pressed below the surface of the device's casework should be:

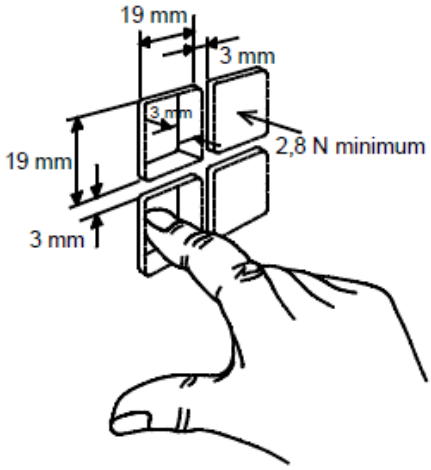
- Size should be at least > 60 mm^2 and preferably > 110 mm^2.
- Travel from 1 mm to 8 mm.
- Force 0.25 N to 1.5 N (snap action feedback). This recommendation does not apply if the passenger needs more than 1.5N to push the button.
- Clearance 9 mm minimum radius from centre.



Example of dimensioning for pushbuttons not pressed below the surface

2) Pushbuttons (pressed below the surface)

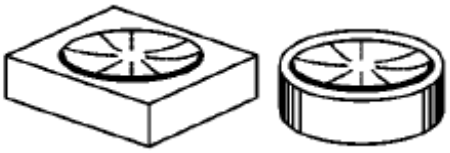
- Minimum dimension 19 mm in any direction.
- Minimum travel 3 mm.
- Minimum force 2.8 N.
- Minimum width 3 mm between adjacent pushbuttons.



Example of dimensioning for pushbuttons pressed below the surface.

B) SHAPE [3]

It is recommended push buttons with flat or concave (dished) sculptured key caps, which accept a good proportion of the finger pad.



CHARACTERS AND SYMBOLS

Characters and symbols on keys should accomplish following requirements [3]:

- The minimum size of the characters should be 16 pt or 4 mm.
- Minimum contrast ratio of 1:3. Good colour combinations to achieve this are white on a black background and white on a dark blue background. Not recommended are: white on a light or pale colour, black on a dark colour, red on green, blue on yellow.

COLOUR

The colour of the button must have a good contrast with respect to the colour of the background. Use the combinations of the following table marked on green. Avoid using the combinations marked in red colour [3][6].

DOOR COLOUR	BUTTON COLOUR							
	BLACK	WHITE	MAGENTA	CYAN	YELLOW	GREEN	RED	BLUE
BLACK	X	+	+	-	+	-	+	-
WHITE	++	X	+	+	-	++	++	++
MAGENTA	+	+	X	-	+	-	-	+
CYAN	-	+	-	X	+	-	-	+
YELLOW	++	+	+	-	X	+	+	
GREEN	-	++	-	-	+	X	-	-
RED	+	++	-	-	+	-	X	+
BLUE	-	++	+	+	+	-	+	X

In the cases where a + or ++ is marked, it has to be considered also the level of contrast of the colours in order to reach an appropriate level of legibility. Appropriate contrast is equal or higher than 4.5 [15]. See ANNEX 3: Contrast of the colours.

FEEDBACK [3]

It is recommended that elderly people notice that the button has been activated. For this reason, some actuation should happen when the button is pressed. The reaction time to key/button actuation must be <= 0.1s . Examples of actuation:

- Audible confirmation of successful key actuation.
- Force feedback: provide conventional ramp or snap-action force/travel keys, force 0.5 N to 1.5 N.
- LED signal as a status check.

Displaying a message on a visual display.

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CASEWORK [3]

Use a casework colour that contrasts with the controls on it.

Avoid using bright red and blue close together in the area of the buttons, these colours have slightly different focal lengths.

If colour is used to code different areas of the casework, or to code different groups of controls etc., avoid using colours too close together in the visual spectrum. (Two or three subtle shades of a pastel colour may simply blur into one for many users).

Avoid shades of blue, green and violet for conveying information - yellowing of the cornea with age interferes with the passage of blue light and can cause confusions between these shades. Use matt rather than gloss finishes in order to minimize glare (diffuse 15 % to 75 %, specular maximum 45 %).

If the casework includes a display ensure the specular reflections of surfaces do not exceed 45 gloss units (silky matt) and the diffuse reflectance is between 15% and 50 %.

3.3 GENERAL ON/OFF BUTTONS

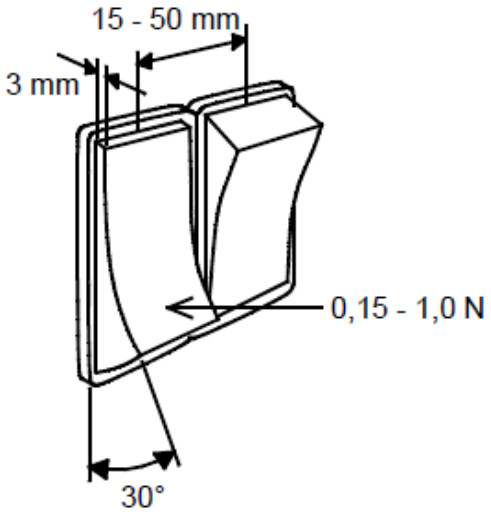
DIMENSIONING [3]

TYPE

For on/off (2 positions) controls use toggle, rocker or push buttons

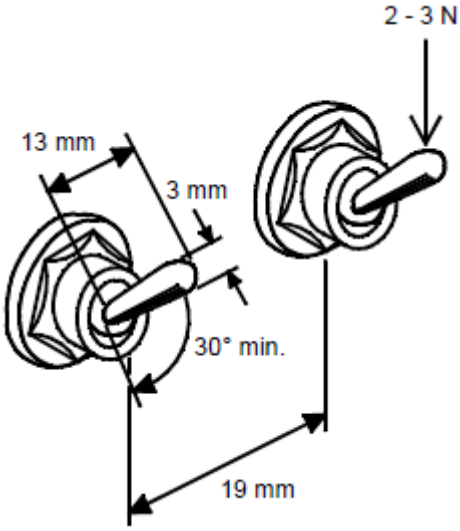
1) Rocker

- Rocker length 12 mm to 50 mm
- Rocker width 6 mm to 25 mm
- Displacement 30°
- Force 0.15 N to 1.0 N
- Separation 15 mm to 50 mm
- Height depressed 3 mm



2) Toggle Switches

Use switches which require an activating force between 2 N and 3 N and travels through an arc 30° (minimum), or 10 mm or more linear displacement with a 3 mm diameter toggle (minimum).



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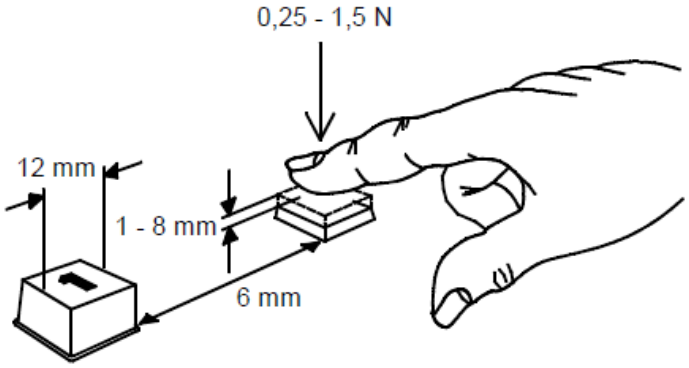

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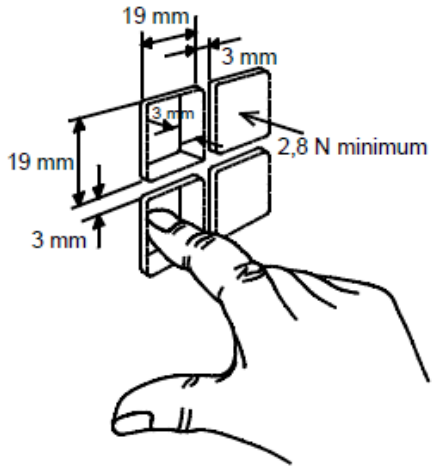

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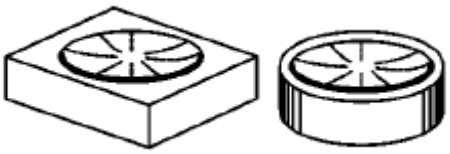


FEEDBACK

Reaction to button actuation must be <= 0.1 seconds [3]. For example:

- Audible or tactile confirmation of successful key actuation.
- Displaying an entered character on a visual display.

COLOUR

The colour of the letters must have a good contrast with respect to the colour of the background. Use the combinations of the next table marked on green. Avoid using the combinations marked in red colour [3][6].

BACKGROUND	SYMBOL AND TEXT							
	BLACK	WHITE	MAGENTA	CYAN	YELLOW	GREEN	RED	BLUE
BLACK	X	+	+	-	+	-	+	-
WHITE	++	X	+	+	-	++	++	++
MAGENTA	+	+	X	-	+	-	-	+
CYAN	-	+	-	X	+	-	-	+
YELLOW	++	+	+	-	X	+	+	
GREEN	-	++	-	-	+	X	-	-
RED	+	++	-	-	+	-	X	+
BLUE	-	++	+	+	+	-	+	X

In the cases where a + or ++ is marked, it has to be considered also the level of contrast of the colours in order to reach an appropriate level of legibility. Appropriate contrast is equal or higher than 4.5 [15]. See ANNEX 1: Check list for usability aspects on tablet PC

The following table show different requirements for Tablet PC divided in mandatory (M) and recommendations (R).

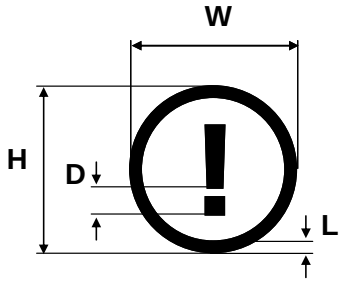
Interface characteristic	Recommendation	Type
Contrast symbols / background	Ratio 1:5	M
Possibility to choice contrast modes	Yes	M
Size letters	3 mm (4,7 mm recommended)	M
Typology numbers	arabic	M
Typology letters	San Serif, non italic and not “extrabold”	M
Alternation case sensitive	Yes, avoid top put all the text in capital or lower letters	M
Possibility to modify the size of the letters	Yes	R
Illumination of the background of the screen.	Yes	R
Possibility of activation of the time of activation of the backlight.	Yes	R
Screen flicker	No	M
Active elements of the labels easily distinguishable	Yes	M
Wallpaper with images	No, or at least you can replace it with a white or black	R
Size active zones	20 mm	M
Separation between symbols	6mm a 12 mm	M
Dead Zone (*)	A third of the separation between symbols, it is recommended between 1 mm and 5 mm	M
Number of active elements	6	R
Number of colours on the screen linked to actions.	4	R
Number of colours, in total, linked to actions.	7	R
Number of menu options	Between 4 and 8	R
Number of menu levels (depth)	Between 3 and 4	R
Auditory feedback when pressed	Yes	M
Tactile feedback when pressed	Yes	R
Visual feedback when pressed	Yes	M
Possibility of visual and auditory feedback configuration.	Yes	R

(*) The figure below shows an example of dead zone (“zona muerta”) and the area between symbols.
ADDITIONAL RECOMMENDATIONS FOR SYMBOLS

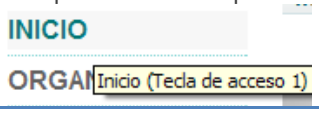
These recommendations are base on the assumption that the user will be Reading the screen at a distance of about 0.5m:

- Line width (L): Bigger than 0.25mm
- Separation between lines: Bigger than 1.5*L
- Smallest detail (D): Bigger than 0.5 mm
- Minimum angle between lines: 30º
- Minimum icon size: Bigger than de 6 mm (to be read) and bigger than 12.5 mm to be highlighted. If possible.

- Ratio high/wide (H/W): Less than 4:1.
- Each symbol must not be more than 2 or 3 components.



ANNEX 2: CHECK LIST FOR DESIGN CRITERIA ON WEB SITES

MINIMUM REQUIREMENTS	ACCOMPLISHMENT	COMMENTS
There are no blinking elements and / or moving to inform or to highlight the interest of some actions.	YES/NO	
There is not a flash movie intro movie in infinite loop	YES/NO	
Size active elements / buttons (not counting the hyperlinks): Circle centered on the center button (diameter 15 mm). Within that circle button is activated, even if the button is smaller.	YES/NO	Example of a non-compliance: 
Must have a maximum depth of 3 levels.	YES/NO	
There is a common layout for buttons / menus / accesses. They are always in the same area and follow the same pattern.	YES/NO	
It should differentiate active buttons: Use thicker border and / or background color highlighting and / or mouse over and / or text color	YES/NO	Example of accomplishment of criteria but with improving possibilities increasing contrast. 
Size letters / symbols, 12-14 or 4.7 mm, between 3.8 - 4.5 mm	YES/NO	
To increase letters size	YES/NO	
San Serif Tipology	YES/NO	
Thickness of letters: no extra thick or extra thin	YES/NO	
Text organized in one only column	YES/NO	
Spacing, 25-30% the size of the source	YES/NO	
Left justification (except for titles and headings)	YES/NO	
Scripture, Combination case (capital letters in headlines only)	YES/NO	
Contrast text, buttons and symbols, brightness greater than 150 and color greater than 500 (this is equivalent to 10:1). At least ask for 3:1, 5:1 being recommended	YES/NO	
Do not use background images or patterns	YES/NO	
Use simple language	YES/NO	
Add text to icons	YES/NO	
Has no horizontal scroll	YES/NO	
Menus: no use walking menus, pop up, etc.	YES/NO	
It is not a push menu, meaning that when you stop clicking the menu disappears dependent on the mouse being located on the menu. In the push menu is it required to click to be deployed.	YES/NO	
Recommended a single click to access, if double click is required it is necessary to allow enough time.	YES/NO	
Button to go up and go home, provided they have navigation hierarchy, more than one screen.	YES/NO	
If it is an information page it must be a search menu	YES/NO	
Facilitate contact of the company	YES/NO	

RECOMMENDED REQUIREMENTS	ACCOMPLISHMENT	COMMENTS
There are no blinking and / or moving elements with ornamental purposes.	YES/NO	
Separation of the active elements / buttons 6-12 mm (non active zone at least 1 third of separation)	YES/NO	
Number of menu options, between 4 and 8	YES/NO	
Active elements, not more than 6 per screen	YES/NO	
Help contextualized	YES/NO	
FAQs	YES/NO	
Color code, throughout the entire color-symbol associated web-based: for example, use green for everything that means accepting, following and red to cancel, back.	YES/NO	
Reserve underlining for hyperlinks	YES/NO	
Differentiate between visited and unvisited links	YES/NO	
Colors, light against dark backgrounds Texts. Use red / orange / yellow for the text and blue / green / purple for the background (not together yellow, green and blue)	YES/NO	
Increase contrast or select from different levels	YES/NO	
Maximum number of colors, do not use more than six colors besides black and white to convey information	YES/NO	
Maximum number of colors for display, 4	YES/NO	
Vertical scroll, minimize their use	YES/NO	
Site map, always when navigation hierarchies are present	YES/NO	
Crumbs, always when navigation hierarchies are present	YES/NO	

ANNEX 3: Contrast of the colours.

CHARACTERS AND SYMBOLS

Fonts for printed instructions [6]

- Use size 12 – 14.
- Use sans-serif fonts, such as ARIAL, HELVETICA, VERDANA and UNIVERSAL.
- Do not write sentences with uppercase letters only.

CASEWORK [3]

When instructions are located on the casework:

- Avoid using bright red and blue close together in an area of high visual workloads, these colours have slightly different focal lengths.
- If colour is used to code different areas of the casework, or to code different groups of controls etc., avoid using colours too close together in the visual spectrum. (Two or three subtle shades of a pastel colour may simply blur into one for many users).
- **Avoid shades of blue, green and violet for conveying information** - yellowing of the cornea with age interferes with the passage of blue light and can cause confusions between these shades. Use matt rather than gloss finishes in order to minimize glare (diffuse 15 % to 75 %, specular maximum 45 %).
- If the casework includes a display ensure the specular reflections of surfaces do not exceed 45 gloss units (silky matt) and the diffuse reflectance is between 15% and 50%.

3.4 LEDs

DIMENSIONING

Flashing and angle of view [3]

Preferred rate of flashing light is 3 to 10 flashes per second, with equal on-off intervals. Do not exceed 12 flashes per second.
Angle of view: 160° minimum. (Position warning signals within 30° of the user's expected line of sight.)

COLOUR

Led-background contrast [3][6]

LEDs (light-emitting diodes) are used in many applications in order to send information to the users. The table below shows the recommended colour combinations (green) considering the background colour.

BACKGROUND	LED COLOUR							
	BLACK	WHITE	MAGENTA	CYAN	YELLOW	GREEN	RED	BLUE
BLACK	X	+	+	+	+	+	-	-
WHITE	+	X	+	-	-	-	+	+
MAGENTA	+	+	X	+	+	+	-	-
CYAN	+	-	+	X	-	-	+	+
YELLOW	+	-	+	-	X	-	+	+
GREEN	+	-	+	-	-	X	-	+
RED	-	+	-	+	+	-	X	-
BLUE	-	+	-	+	+	+	-	X

In the cases where a + or ++ is marked, it has to be considered also the level of contrast of the colours in order to reach an appropriate level of legibility. Appropriate contrast is equal or higher than 4.5 [15]. See ANNEX 1: Check list for usability aspects on tablet PC
The following table show different requirements for Tablet PC divided in mandatory (M) and recommendations (R).

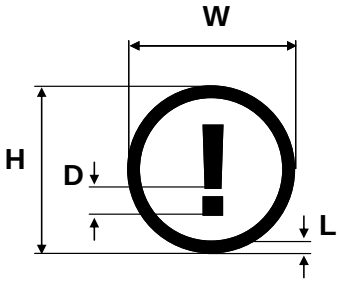
Interface characteristic	Recommendation	Type
Contrast symbols / background	Ratio 1:5	M
Possibility to choice contrast modes	Yes	M
Size letters	3 mm (4,7 mm recommended)	M
Typology numbers	arabic	M
Typology letters	San Serif, non itallic and not “extrabold”	M
Alternation case sensitive	Yes, avoid top put all the text in capital or lower letters	M
Possibility to modify the size of the letters	Yes	R
Illumination of the background of the screen.	Yes	R
Possibility of activation of the time of activation of the backlight.	Yes	R
Screen flicker	No	M

Active elements of the labels easily distinguishable	Yes	M
Wallpaper with images	No, or at least you can replace it with a white or black	R
Size active zones	20 mm	M
Separation between symbols	6mm a 12 mm	M
Dead Zone (*)	A third of the separation between symbols, it is recommended between 1 mm and 5 mm	M
Number of active elements	6	R
Number of colours on the screen linked to actions.	4	R
Number of colours, in total, linked to actions.	7	R
Number of menu options	Between 4 and 8	R
Number of menu levels (depth)	Between 3 and 4	R
Auditory feedback when pressed	Yes	M
Tactile feedback when pressed	Yes	R
Visual feedback when pressed	Yes	M
Possibility of visual and auditory feedback configuration.	Yes	R

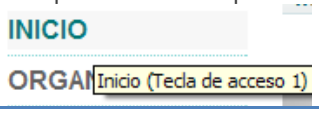
(*) The figure below shows an example of dead zone (“zona muerta”) and the area between symbols.
ADDITIONAL RECOMMENDATIONS FOR SYMBOLS

These recommendations are base on the assumption that the user will be Reading the screen at a distance of about 0.5m:

- Line width (L): Bigger than 0.25mm
- Separation between lines: Bigger than 1.5*L
- Smallest detail (D): Bigger than 0.5 mm
- Minimum angle between lines: 30º
- Minimum icon size: Bigger than de 6 mm (to be read) and bigger than 12.5 mm to be highlighted. If possible.
- Ratio high/wide (H/W): Less than 4:1.
- Each symbol must not be more than 2 or 3 components.



ANNEX 2: CHECK LIST FOR DESIGN CRITERIA ON WEB SITES

MINIMUM REQUIREMENTS	ACCOMPLISHMENT	COMMENTS
There are no blinking elements and / or moving to inform or to highlight the interest of some actions.	YES/NO	
There is not a flash movie intro movie in infinite loop	YES/NO	
Size active elements / buttons (not counting the hyperlinks): Circle centered on the center button (diameter 15 mm). Within that circle button is activated, even if the button is smaller.	YES/NO	Example of a non-compliance: 
Must have a maximum depth of 3 levels.	YES/NO	
There is a common layout for buttons / menus / accesses. They are always in the same area and follow the same pattern.	YES/NO	
It should differentiate active buttons: Use thicker border and / or background color highlighting and / or mouse over and / or text color	YES/NO	Example of accomplishment of criteria but with improving possibilities increasing contrast. 
Size letters / symbols, 12-14 or 4.7 mm, between 3.8 - 4.5 mm	YES/NO	
To increase letters size	YES/NO	
San Serif Tipology	YES/NO	
Thickness of letters: no extra thick or extra thin	YES/NO	
Text organized in one only column	YES/NO	
Spacing, 25-30% the size of the source	YES/NO	
Left justification (except for titles and headings)	YES/NO	
Scripture, Combination case (capital letters in headlines only)	YES/NO	
Contrast text, buttons and symbols, brightness greater than 150 and color greater than 500 (this is equivalent to 10:1). At least ask for 3:1, 5:1 being recommended	YES/NO	
Do not use background images or patterns	YES/NO	
Use simple language	YES/NO	
Add text to icons	YES/NO	
Has no horizontal scroll	YES/NO	
Menus: no use walking menus, pop up, etc.	YES/NO	
It is not a push menu, meaning that when you stop clicking the menu disappears dependent on the mouse being located on the menu. In the push menu is it required to click to be deployed.	YES/NO	
Recommended a single click to access, if double click is required it is necessary to allow enough time.	YES/NO	
Button to go up and go home, provided they have navigation hierarchy, more than one screen.	YES/NO	
If it is an information page it must be a search menu	YES/NO	
Facilitate contact of the company	YES/NO	

RECOMMENDED REQUIREMENTS	ACCOMPLISHMENT	COMMENTS
There are no blinking and / or moving elements with ornamental purposes.	YES/NO	
Separation of the active elements / buttons 6-12 mm (non active zone at least 1 third of separation)	YES/NO	
Number of menu options, between 4 and 8	YES/NO	
Active elements, not more than 6 per screen	YES/NO	
Help contextualized	YES/NO	
FAQs	YES/NO	
Color code, throughout the entire color-symbol associated web-based: for example, use green for everything that means accepting, following and red to cancel, back.	YES/NO	
Reserve underlining for hyperlinks	YES/NO	
Differentiate between visited and unvisited links	YES/NO	
Colors, light against dark backgrounds Texts. Use red / orange / yellow for the text and blue / green / purple for the background (not together yellow, green and blue)	YES/NO	
Increase contrast or select from different levels	YES/NO	
Maximum number of colors, do not use more than six colors besides black and white to convey information	YES/NO	
Maximum number of colors for display, 4	YES/NO	
Vertical scroll, minimize their use	YES/NO	
Site map, always when navigation hierarchies are present	YES/NO	
Crumbs, always when navigation hierarchies are present	YES/NO	

ANNEX 3: Contrast of the colours.

LEDs may become illegible in very bright conditions such as full sunlight, with green and yellow LEDs being worst affected.
Recommended brightness level: 160 candelas/m^2 minimum

Usual colour conventions[3]

- Red for stop, or danger
- Green for normal or go
- Amber/yellow for caution
- White/blue for normal conditions

3.5 SCREEN FOR INFORMATION

DIMENSIONING

When the user can interact with the screen and regulate the position, it is recommended a screen tilt to avoid reflections: -5º to 20º from the vertical [3].

COLOUR

When text or symbols are displayed on the screen, colour contrast between foreground and background should be such that the symbol or text can be perfectly read. The table below shows the recommended colour combinations (in green) considering the background colour [3][6].

BACKGROUND	LED COLOUR							
	BLACK	WHITE	MAGENTA	CYAN	YELLOW	GREEN	RED	BLUE
BLACK	X	+	+	+	+	+	-	-
WHITE	+	X	+	-	-	-	+	+
MAGENTA	+	+	X	+	+	+	-	-
CYAN	+	-	+	X	-	-	+	+
YELLOW	+	-	+	-	X	-	+	+
GREEN	+	-	+	-	-	X	-	+
RED	-	+	-	+	+	-	X	-
BLUE	-	+	-	+	+	+	-	X

In the cases where a + or ++ is marked, it has to be considered also the level of contrast of the colours in order to reach an appropriate level of legibility. Appropriate contrast is equal or higher than 4.5 [15]. See ANNEX 1: Check list for usability aspects on tablet PC

The following table show different requirements for Tablet PC divided in mandatory (M) and recommendations (R).

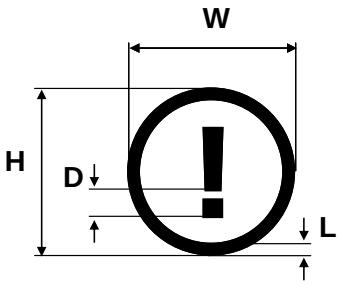
Interface characteristic	Recommendation	Type
Contrast symbols / background	Ratio 1:5	M
Possibility to choice contrast modes	Yes	M
Size letters	3 mm (4,7 mm recommended)	M
Typology numbers	arabic	M
Typology letters	San Serif, non italic and not “extrabold”	M
Alternation case sensitive	Yes, avoid top put all the text in capital or lower letters	M
Possibility to modify the size of the letters	Yes	R
Illumination of the background of the screen.	Yes	R
Possibility of activation of the time of activation of the backlight.	Yes	R
Screen flicker	No	M
Active elements of the labels easily distinguishable	Yes	M
Wallpaper with images	No, or at least you can replace it with a	R

	white or black	
Size active zones	20 mm	M
Separation between symbols	6mm a 12 mm	M
Dead Zone (*)	A third of the separation between symbols, it is recommended between 1 mm and 5 mm	M
Number of active elements	6	R
Number of colours on the screen linked to actions.	4	R
Number of colours, in total, linked to actions.	7	R
Number of menu options	Between 4 and 8	R
Number of menu levels (depth)	Between 3 and 4	R
Auditory feedback when pressed	Yes	M
Tactile feedback when pressed	Yes	R
Visual feedback when pressed	Yes	M
Possibility of visual and auditory feedback configuration.	Yes	R

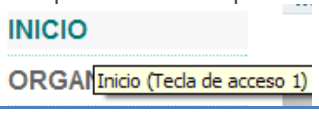
(*) The figure below shows an example of dead zone (“zona muerta”) and the area between symbols.
ADDITIONAL RECOMMENDATIONS FOR SYMBOLS

These recommendations are base on the assumption that the user will be Reading the screen at a distance of about 0.5m:

- Line width (L): Bigger than 0.25mm
- Separation between lines: Bigger than 1.5*L
- Smallest detail (D): Bigger than 0.5 mm
- Minimum angle between lines: 30º
- Minimum icon size: Bigger than de 6 mm (to be read) and bigger than 12.5 mm to be highlighted. If possible.
- Ratio high/wide (H/W): Less than 4:1.
- Each symbol must not be more than 2 or 3 components.



ANNEX 2: CHECK LIST FOR DESIGN CRITERIA ON WEB SITES

MINIMUM REQUIREMENTS	ACCOMPLISHMENT	COMMENTS
There are no blinking elements and / or moving to inform or to highlight the interest of some actions.	YES/NO	
There is not a flash movie intro movie in infinite loop	YES/NO	
Size active elements / buttons (not counting the hyperlinks): Circle centered on the center button (diameter 15 mm). Within that circle button is activated, even if the button is smaller.	YES/NO	Example of a non-compliance: 
Must have a maximum depth of 3 levels.	YES/NO	
There is a common layout for buttons / menus / accesses. They are always in the same area and follow the same pattern.	YES/NO	
It should differentiate active buttons: Use thicker border and / or background color highlighting and / or mouse over and / or text color	YES/NO	Example of accomplishment of criteria but with improving possibilities increasing contrast. 
Size letters / symbols, 12-14 or 4.7 mm, between 3.8 - 4.5 mm	YES/NO	
To increase letters size	YES/NO	
San Serif Tipology	YES/NO	
Thickness of letters: no extra thick or extra thin	YES/NO	
Text organized in one only column	YES/NO	
Spacing, 25-30% the size of the source	YES/NO	
Left justification (except for titles and headings)	YES/NO	
Scripture, Combination case (capital letters in headlines only)	YES/NO	
Contrast text, buttons and symbols, brightness greater than 150 and color greater than 500 (this is equivalent to 10:1). At least ask for 3:1, 5:1 being recommended	YES/NO	
Do not use background images or patterns	YES/NO	
Use simple language	YES/NO	
Add text to icons	YES/NO	
Has no horizontal scroll	YES/NO	
Menus: no use walking menus, pop up, etc.	YES/NO	
It is not a push menu, meaning that when you stop clicking the menu disappears dependent on the mouse being located on the menu. In the push menu is it required to click to be deployed.	YES/NO	
Recommended a single click to access, if double click is required it is necessary to allow enough time.	YES/NO	
Button to go up and go home, provided they have navigation hierarchy, more than one screen.	YES/NO	
If it is an information page it must be a search menu	YES/NO	
Facilitate contact of the company	YES/NO	

RECOMMENDED REQUIREMENTS	ACCOMPLISHMENT	COMMENTS
There are no blinking and / or moving elements with ornamental purposes.	YES/NO	
Separation of the active elements / buttons 6-12 mm (non active zone at least 1 third of separation)	YES/NO	
Number of menu options, between 4 and 8	YES/NO	
Active elements, not more than 6 per screen	YES/NO	
Help contextualized	YES/NO	
FAQs	YES/NO	
Color code, throughout the entire color-symbol associated web-based: for example, use green for everything that means accepting, following and red to cancel, back.	YES/NO	
Reserve underlining for hyperlinks	YES/NO	
Differentiate between visited and unvisited links	YES/NO	
Colors, light against dark backgrounds Texts. Use red / orange / yellow for the text and blue / green / purple for the background (not together yellow, green and blue)	YES/NO	
Increase contrast or select from different levels	YES/NO	
Maximum number of colors, do not use more than six colors besides black and white to convey information	YES/NO	
Maximum number of colors for display, 4	YES/NO	
Vertical scroll, minimize their use	YES/NO	
Site map, always when navigation hierarchies are present	YES/NO	
Crumbs, always when navigation hierarchies are present	YES/NO	

ANNEX 3: Contrast of the colours.

CHARACTERS AND SYMBOLS

Size of characters and symbols is directly dependant on the distance they are. If the information screen is directly in front of the user, the characters can be small. However, if the screen is far from the user, the characters and signs must necessarily be large to be read and distinguished appropriately. The relationship between distance and character size can be obtained from the following table [5]:

READING DISTANCE (M)	1	2	3	4	5
CHARACTER OR SYMBOL SIZE (CM)	2.8	5.6	8.4	11.2	14.0

COGNITION

Avoid scrolling (vertical or horizontal) on visual displays. If scrolling is necessary, use vertical scrolling with a minimum of 4 lines. It is recommended a minimum of 40 characters per line for long messages [3].

3.6 TACTILE SCREENS

DIMENSIONING

When the user can interact with the screen and regulate the position, it is recommended a screen tilt to avoid reflections: -5º to 20º from the vertical [3].

COLOUR

When text or symbols are displayed on the screen, colour contrast between foreground and background should be such that the symbol or text can be perfectly read. The table below shows the recommended colour combinations (in green) considering the background colour [3][6].

BACKGROUND	LED COLOUR							
	BLACK	WHITE	MAGENTA	CYAN	YELLOW	GREEN	RED	BLUE
BLACK	X	+	+	+	+	+	-	-
WHITE	+	X	+	-	-	-	+	+
MAGENTA	+	+	X	+	+	+	-	-
CYAN	+	-	+	X	-	-	+	+
YELLOW	+	-	+	-	X	-	+	+
GREEN	+	-	+	-	-	X	-	+
RED	-	+	-	+	+	-	X	-
BLUE	-	+	-	+	+	+	-	X

In the cases where a + or ++ is marked, it has to be considered also the level of contrast of the colours in order to reach an appropriate level of legibility. Appropriate contrast is equal or higher than 4.5 [15]. See ANNEX 1: Check list for usability aspects on tablet PC

The following table show different requirements for Tablet PC divided in mandatory (M) and recommendations (R).

Interface characteristic	Recommendation	Type
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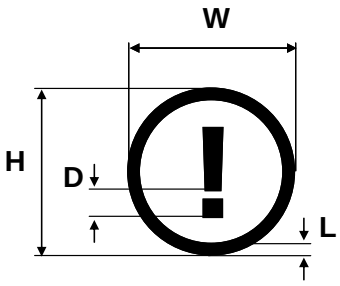
Possibility to choice contrast modes	Yes	M
Size letters	3 mm (4,7 mm recommended)	M
Typology numbers	arabic	M
Typology letters	San Serif, non italic and not “extrabold”	M
Alternation case sensitive	Yes, avoid top put all the text in capital or lower letters	M
Possibility to modify the size of the letters	Yes	R
Illumination of the background of the screen.	Yes	R
Possibility of activation of the time of activation of the backlight.	Yes	R
Screen flicker	No	M
Active elements of the labels easily distinguishable	Yes	M
Wallpaper with images	No, or at least you can replace it with a	R

	white or black	
Size active zones	20 mm	M
Separation between symbols	6mm a 12 mm	M
Dead Zone (*)	A third of the separation between symbols, it is recommended between 1 mm and 5 mm	M
Number of active elements	6	R
Number of colours on the screen linked to actions.	4	R
Number of colours, in total, linked to actions.	7	R
Number of menu options	Between 4 and 8	R
Number of menu levels (depth)	Between 3 and 4	R
Auditory feedback when pressed	Yes	M
Tactile feedback when pressed	Yes	R
Visual feedback when pressed	Yes	M
Possibility of visual and auditory feedback configuration.	Yes	R

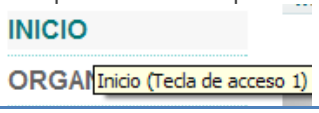
(*) The figure below shows an example of dead zone (“zona muerta”) and the area between symbols.
ADDITIONAL RECOMMENDATIONS FOR SYMBOLS

These recommendations are base on the assumption that the user will be Reading the screen at a distance of about 0.5m:

- Line width (L): Bigger than 0.25mm
- Separation between lines: Bigger than 1.5*L
- Smallest detail (D): Bigger than 0.5 mm
- Minimum angle between lines: 30º
- Minimum icon size: Bigger than de 6 mm (to be read) and bigger than 12.5 mm to be highlighted. If possible.
- Ratio high/wide (H/W): Less than 4:1.
- Each symbol must not be more than 2 or 3 components.



ANNEX 2: CHECK LIST FOR DESIGN CRITERIA ON WEB SITES

MINIMUM REQUIREMENTS	ACCOMPLISHMENT	COMMENTS
There are no blinking elements and / or moving to inform or to highlight the interest of some actions.	YES/NO	
There is not a flash movie intro movie in infinite loop	YES/NO	
Size active elements / buttons (not counting the hyperlinks): Circle centered on the center button (diameter 15 mm). Within that circle button is activated, even if the button is smaller.	YES/NO	Example of a non-compliance: 
Must have a maximum depth of 3 levels.	YES/NO	
There is a common layout for buttons / menus / accesses. They are always in the same area and follow the same pattern.	YES/NO	
It should differentiate active buttons: Use thicker border and / or background color highlighting and / or mouse over and / or text color	YES/NO	Example of accomplishment of criteria but with improving possibilities increasing contrast. 
Size letters / symbols, 12-14 or 4.7 mm, between 3.8 - 4.5 mm	YES/NO	
To increase letters size	YES/NO	
San Serif Tipology	YES/NO	
Thickness of letters: no extra thick or extra thin	YES/NO	
Text organized in one only column	YES/NO	
Spacing, 25-30% the size of the source	YES/NO	
Left justification (except for titles and headings)	YES/NO	
Scripture, Combination case (capital letters in headlines only)	YES/NO	
Contrast text, buttons and symbols, brightness greater than 150 and color greater than 500 (this is equivalent to 10:1). At least ask for 3:1, 5:1 being recommended	YES/NO	
Do not use background images or patterns	YES/NO	
Use simple language	YES/NO	
Add text to icons	YES/NO	
Has no horizontal scroll	YES/NO	
Menus: no use walking menus, pop up, etc.	YES/NO	
It is not a push menu, meaning that when you stop clicking the menu disappears dependent on the mouse being located on the menu. In the push menu is it required to click to be deployed.	YES/NO	
Recommended a single click to access, if double click is required it is necessary to allow enough time.	YES/NO	
Button to go up and go home, provided they have navigation hierarchy, more than one screen.	YES/NO	
If it is an information page it must be a search menu	YES/NO	
Facilitate contact of the company	YES/NO	

RECOMMENDED REQUIREMENTS	ACCOMPLISHMENT	COMMENTS
There are no blinking and / or moving elements with ornamental purposes.	YES/NO	
Separation of the active elements / buttons 6-12 mm (non active zone at least 1 third of separation)	YES/NO	
Number of menu options, between 4 and 8	YES/NO	
Active elements, not more than 6 per screen	YES/NO	
Help contextualized	YES/NO	
FAQs	YES/NO	
Color code, throughout the entire color-symbol associated web-based: for example, use green for everything that means accepting, following and red to cancel, back.	YES/NO	
Reserve underlining for hyperlinks	YES/NO	
Differentiate between visited and unvisited links	YES/NO	
Colors, light against dark backgrounds Texts. Use red / orange / yellow for the text and blue / green / purple for the background (not together yellow, green and blue)	YES/NO	
Increase contrast or select from different levels	YES/NO	
Maximum number of colors, do not use more than six colors besides black and white to convey information	YES/NO	
Maximum number of colors for display, 4	YES/NO	
Vertical scroll, minimize their use	YES/NO	
Site map, always when navigation hierarchies are present	YES/NO	
Crumbs, always when navigation hierarchies are present	YES/NO	

ANNEX 3: Contrast of the colours.

CHARACTERS AND SYMBOLS

The relationship between distance and character size can be obtained from the following table (for other values, proceed to linear interpolation) [6]:

READING DISTANCE (M)	1	2
CHARACTER OR SYMBOL SIZE (CM)	2.8	5.6

COGNITION

Avoid scrolling (vertical or horizontal) on visual displays. If scrolling is necessary, use vertical scrolling with a minimum of 4 lines. It is recommended a minimum of 40 characters per line for long messages [3].

3.7 SPEAKER

DIMENSIONING
The sound messages will be 15 dB above ambient sound [5].
Use tones of frequencies (pitch) between 300 Hz and 3000 Hz where the human ear is most sensitive [3].

4. THE SIMPLIT APPROACH

SIMPLIT is a certificate which attests that a product is simple, practical and user-friendly. It guarantees that products have been developed with a design based on elderly people, fostering an increase in the quality of the products available on the market, and engaging elderly people in assessment.

SIMPLIT is an initiative of the Unión Democrática de Pensionistas y Jubilados de España (UDP) and the Instituto de Biomecánica de Valencia (IBV), which features the participation of the Asociación Española de Normalización y Certificación (AENOR) and the support of the Ministry of Health and Social Policy. This certification also enjoys the support of Fagor, Armariada, Isaba, Telefónica and other leading companies.

The development of the SIMPLIT certificate involved the revision of compulsory legislation at international, European and national level of all kinds of products, with a bibliographic review of more than 100 standards catalogued and classified according to the type of product and which permit rapid verification of compliance. The check list presented on annex I and II os this report were partially obtained from this review and from the experience of the application of the SIMPLIT certificate to web design and tablet PC validation.

With the SIMPLIT approach the elisa consortium will be able to demonstrate that the elisa system has been designed according to easy-use criteria, targeting elderly people. By guaranteeing simplicity, SIMPLIT benefits everyone. In most cases, creating a product suited to elderly people means creating an ideal product for everyone.

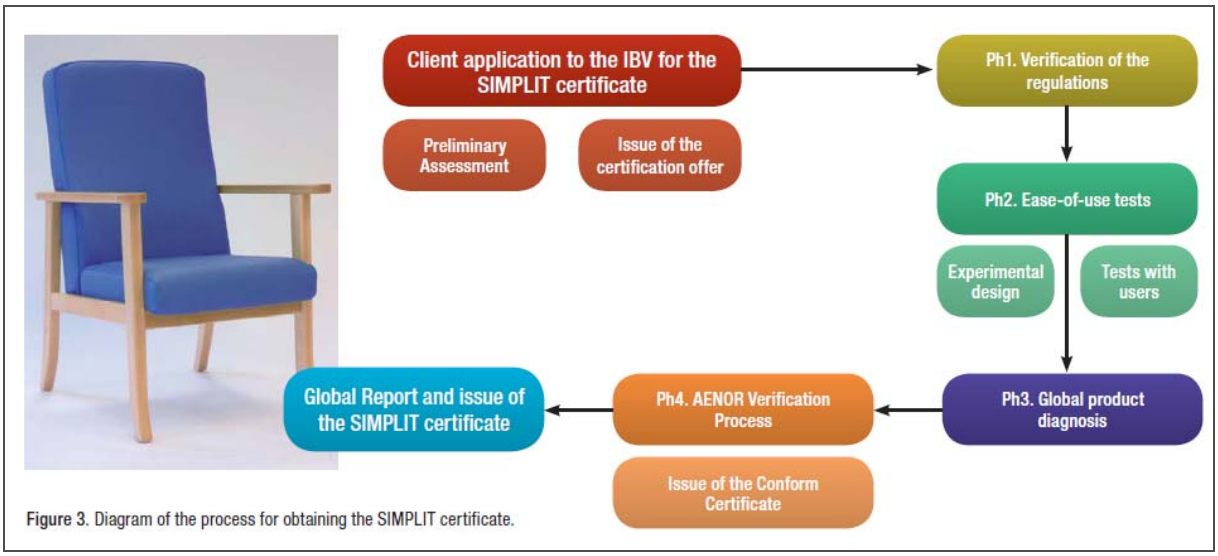


Figure 3. Diagram of the process for obtaining the SIMPLIT certificate.

How does SIMPLIT work in the elisa project?

SIMPLIT rates aspects such as how easy a product is to learn to use, and its efficacy. The application of the inspection procedure, which concludes with the issue of the SIMPLIT certificate, will always require the participation of a group of older people, since this is regarded as a characteristic and distinguishing aspect of the certificate. The participation of older people is explained in D5.1 test and Evaluation specification and will be developed in more detail for the following prototypes.

The basic inspection procedure is based on the following principles:

- Open the proceedings, considering how mature the product is.
- Contextualise the product, identifying the consumer profile and the characteristics and conditions of use.
- Check compliance with the legislation on safety and basic ergonomics of the product to guarantee that it fulfills the minimum conditions for obtaining the SIMPLIT certificate.
- Analyse the learning of tasks, ease of use and efficacy of implementation, performing a diagnosis of the product based on the participation of elderly people in the assessment.
- Make sure that the product diagnosis is performed systematically by means of an AENOR audit.
- And, if it passes the diagnosis satisfactorily, receive the SIMPLIT and AENOR Conform certifications.

5. CONCLUSIONS

Derived from many studies in the past there exists a common sense of usability preconditions that can be considered while product development.

- Readability of fonts and symbols on control elements → Fonts and symbols large enough and unmistakable, with significant contrast to background, good to see in different incidence of light (p.r.n. illuminated)
- Readability of fonts, symbols, and graphics on screen → Fonts, symbols, and graphics large enough and with high contrast, no dazzle or distortion by display/screen
- Usability of hardware (e.g. key, button) → Keys and buttons large enough and clearly to differentiate, feed-back to user at activation
- Usability of software → software menus understandable, management with mouse reasonably designed, fast return to starting point must be possible
- Intuitive handling of device → handling of device simple and without reflection or complex conclusions
- Comprehensibility of manual → understandable operating steps with explanation and fast replicability
- *Source: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin 2009 (p18)*

How does a user-friendly product look like?

- Flexible, easily and intuitively to handle
- Sensorially well perceptible information
- High fault tolerance
- Only little physical effort for usage
- Sufficiently size for entry and usage
- Long life span
- User-friendly manual
- Clear and well structured
- Easy to read font(size)
- Informative figures
- Highlighted safety notes
- No Anglicism, glossary with most important terms

The information allocated in this point refers mainly to web and human computer interface usability and accessibility. More usability preconditions may be given when the idea of the concept is more detailed. Annexes I and II transform all this recommendations into a specific check list to make easier their application.

The application of the SIMPLIT approach in the validation of the elisa system will ensure that the requirements, needs and preferences of the elder population are fully integrated into the final development of the elisa System.

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ANNEX 1: CHECK LIST FOR USABILITY ASPECTS ON TABLET PC

The following table show different requirements for Tablet PC divided in mandatory (M) and recommendations (R).

Interface characteristic	Recommendation	Type
Contrast symbols / background	Ratio 1:5	M
Possibility to choice contrast modes[1]	Yes	M
Size letters	3 mm (4,7 mm recommended)	M
Typology numbers	arabic	M
Typology letters	San Serif, non itallic and not “extrabold”	M
Alternation case sensitive	Yes, avoid top put all the text in capital or lower letters	M
Possibility to modify the size of the letters	Yes	R
Illumination of the background of the screen.	Yes	R
Possibility of activation of the time of activation of the backlight.	Yes	R
Screen flicker	No	M
Active elements of the labels easily distinguishable	Yes	M
Wallpaper with images	No, or at least you can replace it with a white or black	R
Size active zones	20 mm	M
Separation between symbols	6mm a 12 mm	M
Dead Zone (*)	A third of the separation between symbols, it is recommended between 1 mm and 5 mm	M
Number of active elements	6	R
Number of colours on the screen linked to actions.	4	R
Number of colours, in total, linked to actions.	7	R
Number of menu options	Between 4 and 8	R
Number of menu levels (depth)	Between 3 and 4	R
Auditory feedback when pressed	Yes	M
Tactile feedback when pressed	Yes	R
Visual feedback when pressed	Yes	M
Possibility of visual and auditory feedback configuration.	Yes	R

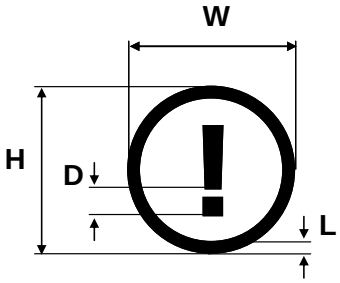
(*) The figure below shows an example of dead zone (“zona muerta”) and the area between symbols.

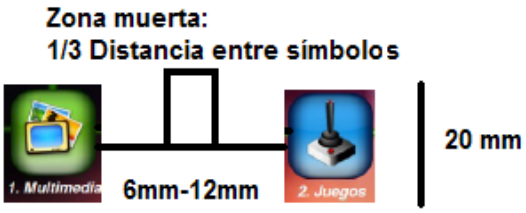
[1] For instance, Mode high contrast, Black in high contrast, White in high contrast.

ADDITIONAL RECOMMENDATIONS FOR SYMBOLS

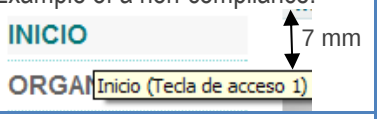
These recommendations are base on the assumption that the user will be Reading the screen at a distance of about 0.5m:

- Line width (L): Bigger than 0.25mm
- Separation between lines: Bigger than 1.5*L
- Smallest detail (D): Bigger than 0.5 mm
- Minimum angle between lines: 30º
- Minimum icon size: Bigger than de 6 mm (to be read) and bigger than 12.5 mm to be highlighted. If possible.
- Ratio high/wide (H/W): Less than 4:1.
- Each symbol must not be more than 2 or 3 components.





ANNEX 2: CHECK LIST FOR DESIGN CRITERIA ON WEB SITES

MINIMUM REQUIREMENTS	ACCOMPLISHMENT	COMMENTS
There are no blinking elements and / or moving to inform or to highlight the interest of some actions.	YES/NO	
There is not a flash movie intro movie in infinite loop	YES/NO	
Size active elements / buttons (not counting the hyperlinks): Circle centered on the center button (diameter 15 mm). Within that circle button is activated, even if the button is smaller.	YES/NO	Example of a non-compliance: 
Must have a maximum depth of 3 levels.	YES/NO	
There is a common layout for buttons / menus / accesses. They are always in the same area and follow the same pattern.	YES/NO	
It should differentiate active buttons: Use thicker border and / or background color highlighting and / or mouse over and / or text color	YES/NO	Example of accomplishment of criteria but with improving possibilities increasing contrast. 
Size letters / symbols, 12-14 or 4.7 mm, between 3.8 - 4.5 mm	YES/NO	
To increase letters size	YES/NO	
San Serif Tipology	YES/NO	
Thickness of letters: no extra thick or extra thin	YES/NO	
Text organized in one only column	YES/NO	
Spacing, 25-30% the size of the source	YES/NO	
Left justification (except for titles and headings)	YES/NO	
Scripture, Combination case (capital letters in headlines only)	YES/NO	
Contrast text, buttons and symbols, brightness greater than 150 and color greater than 500 (this is equivalent to 10:1). At least ask for 3:1, 5:1 being recommended	YES/NO	
Do not use background images or patterns	YES/NO	
Use simple language	YES/NO	
Add text to icons	YES/NO	
Has no horizontal scroll	YES/NO	
Menus: no use walking menus, pop up, etc.	YES/NO	
It is not a push menu, meaning that when you stop clicking the menu disappears dependent on the mouse being located on the menu. In the push menu is it required to click to be deployed.	YES/NO	
Recommended a single click to access, if double click is required it is necessary to allow enough time.	YES/NO	
Button to go up and go home, provided they have navigation hierarchy, more than one screen.	YES/NO	
If it is an information page it must be a search menu	YES/NO	
Facilitate contact of the company	YES/NO	

RECOMMENDED REQUIREMENTS	ACCOMPLISHMENT	COMMENTS
There are no blinking and / or moving elements with ornamental purposes.	YES/NO	
Separation of the active elements / buttons 6-12 mm (non active zone at least 1 third of separation)	YES/NO	
Number of menu options, between 4 and 8	YES/NO	
Active elements, not more than 6 per screen	YES/NO	
Help contextualized	YES/NO	
FAQs	YES/NO	
Color code, throughout the entire color-symbol associated web-based: for example, use green for everything that means accepting, following and red to cancel, back.	YES/NO	
Reserve underlining for hyperlinks	YES/NO	
Differentiate between visited and unvisited links	YES/NO	
Colors, light against dark backgrounds Texts. Use red / orange / yellow for the text and blue / green / purple for the background (not together yellow, green and blue)	YES/NO	
Increase contrast or select from different levels	YES/NO	
Maximum number of colors, do not use more than six colors besides black and white to convey information	YES/NO	
Maximum number of colors for display, 4	YES/NO	
Vertical scroll, minimize their use	YES/NO	
Site map, always when navigation hierarchies are present	YES/NO	
Crumbs, always when navigation hierarchies are present	YES/NO	

ANNEX 3: CONTRAST OF THE COLOURS

The contrast can be calculated by means of the RGB values of each colour, according to the following expressions [15].

First, calculate the relative luminance of each colour (L1 and L2):

$$L = 0.2126 * R + 0.7152 * G + 0.0722 * B$$

Where R, G and B are defined as:

if $R_{sRGB} <= 0.03928$ then $R = R_{sRGB} /12.92$
else $R = ((R_{sRGB} +0.055)/1.055) ^ 2.4$
if $G_{sRGB} <= 0.03928$ then $G = G_{sRGB}/12.92$
else $G = ((G_{sRGB}+0.055)/1.055) ^ 2.4$
if $B_{sRGB} <= 0.03928$ then $B = B_{sRGB}/12.92$
else $B = ((B_{sRGB}+0.055)/1.055) ^ 2.4$

Second, calculate the contrast ratio:

$CONTRAST = (L1 + 0.05) / (L2 + 0.05) \geq 4.5$, where
L1 is the relative luminance of the lighter colour and
L2 is the relative luminance of the darker colour.