

# WEB ACCESIBLE DESIGN CENTRED ON USER EXPERIENCE

Marc Pifarré, Eva Villegas, David Fonseca  
GTM-Grup de Recerca en Tecnologies Mèdia LA SALLE - UNIVERSITAT RAMON LLULL, Barcelona,  
Spain  
{ mpifarre, evillegas, fonsi }@salle.url.edu

## ABSTRACT

An accessible web page needs to follow the rules marked by the W3C (World Wide Web Consortium) and WCAG 2.0 (Web Content Accessibility Guidelines).

The problem of the rules AA of web accessibility is that they are centered on the programming requisites more than the user needs for graphic design, functionalities or content. An important factor to take in account in accessibility standards is the lack of distinction between the different user's profiles, since every type of disability will have particular requisites it will be difficult that standards adapt themselves to the needs of the final user.

With the target of improving the reliability of the information obtained in studies of accessibility for web pages a project based on the integration of different methodologies has been realized. The methodological design applied in this study centers on the participation of the users like principal item to obtain significant results. Using methods centered on users more than accessibility standards allows obtaining reliable information about the real needs of the users. Departing from this basis is able to get a web site design properly adapted to the user's needs.

**Keywords:** Accessibility, User Experience, WAI, User-centred-design, WCAG, Web Design.

## 1 INTRODUCTION

The rules published by the World Wide Web Consortium (W3C) and the Web Accessibility Initiative (WAI) are considered to be a standard that marks the requisites that allow the creation of accessible pages for all. Accessibility is understood as a web page designed and programmed so that the content is free for any user, independently of their profile.

The target of this project is to create a base for the achievement of a web design adapted to the needs of every type of user. To manage this main objective it has been necessary to bear in mind the peculiarities of every disability; to define – with reliability – the spaces of the web that can be common to all the users; and to define those that must be individualized or customized to concrete user requisites.

To establish a list of the initial needs for a trustworthy method, a users study was conducted inside a web page with level of *Double A* (AA). This study was created by means of a combination of methodologies that allowed obtaining concrete information about the needs of the users. It would be very difficult to obtain all of this information by

means of the accessibility rules, because the use of the standards means there is no concrete information about the needs of the user.

As soon as the information was obtained, a web page was created, bearing in mind the obtained results, and the second test was conducted to verify whether the experience of the users was improving with regard to the page tested in the initial phase.

## 2 METHODOLOGY

### 2.1 Phase 1. Objectives

The target of this project is to create a virtual community destined for user groups with different disabilities.

Different techniques have been applied to evaluate the user's experience by integrating the methodologies of accessibility, classic usability, and new qualitative methods applied on user experience field.

### 2.2 Phase 1. Test Design

We have designed the test to analyze a web page with a level of *Double A* (AA), emphasizing

what methodology is the most suitable. Different factors were born in mind, one of the most decisive was the users' type.

To be able to decide the most suitable user's sample, we analyzed them according to the World Health Organization classification [1], which defines six types of difficulties:

- Difficulties derived from mobility problems.
- Difficulties derived from sight problems.
- Difficulties derived from hearing problems.
- Difficulties derived from language, speech, and voice impairments.
- Learning difficulties.
- Difficulties derived from mental illnesses or disorders.

We analyzed all the profiles to choose the most decisive sample at the time of beginning the web test. The result of this was the following groups:

- Group 1: Twelve persons with difficulties derived from physical and cognitive problems.
- Group 2: An expert in persons with difficulties derived from physical and cognitive problems.
- Group 3: Twelve persons with difficulties derived from visual problems, consisting of six users with entire blindness and six users with poor or partial vision.
- Group 4: An expert in persons with difficulties derived from visual problems.
- Group 5: Twelve persons with difficulties derived from hearing problems, made up of six deaf users who use sign language users and six deaf users who do not use sign language.
- Group 6: An expert in persons with difficulties derived from auditory problems.
- Group 7: Or control group with users without any type of difficulty accessing Internet information at the time.

The realized analysis allows us to adapt the results to other disabilities, for which we have other secondary profiles in mind. For example, profiles could be adapted for users with dichromatopsia (visual disability that affects perception of red, green, blue, and yellow colors) or for third-age persons [2], or they could be based on other determinants that affect the above-mentioned groups, such as slow connections or minimal use of electronic commerce. (The main use of the Internet in these profiles is for e-mail (66%); accessing information on administrative pages (49%); and

mass media (43%).)

For the groups of persons with difficulties, the following methodologies were applied:

- Methodology of Classic Usability:
  - Questionnaire of Previous Profile.
  - Tasks Test.
  - Satisfaction User Survey (SUS [3]).
- New techniques of user's experience
  - *Bipolar Laddering (BLA)* [4] interview (limited version).

For the group of experts in the different disciplines, a particular methodology was applied:

- Questionnaire of Previous Profile.
- *Bipolar Laddering interview* (full version).

The **questionnaire of previous profile** allows detailed knowledge of the profile of the user and of their level of Internet use, what type of tasks the user accomplishes or wants to accomplish, and what type of information they wish to receive.

The **tasks test** is used to observe the behavior of the user in terms of Internet use (by means of the navigation for a web page AA), but not ratification of the usability of the page. Quantitative information was gathered according to: successful task (well-finished task), failure task (unfinished task), false success (unfinished task that the user perceives as correct), and false failure (finished task that the user perceives as not accomplished). During the test, we use the Protocol of Clear Thought: on the one hand, the user shows or expresses the considerations during his navigation for the web; and on the other hand, by means of the question-answer protocol, the reactions of the user are provoked by means of the formulation of direct questions regarding his interaction with the application.

The **Satisfaction User Survey (SUS)** was used to detect the grade of satisfaction of the user. Ten questions are exhibited to the user, which he or she must answer on a scale of the 1 to 5 (how strongly he or she agrees with the affirmation), thereby obtaining numerical values on their satisfaction levels.

The **Bipolar Laddering (BLA)** technique is a methodology that allows the realization of a qualitative field study and obtains the perceived strong and weak points of a product or service based on the user's experience. It is conducted using a format of interviews, during which the user explores the product and relates their experience.

From this interview model, the user generates lists of significant elements and defines them by means of laddering technique. The levels of satisfaction and relevancy of every element is then

represented in a numerical scale from 0 to 10, in which the user attributes the punctuation depending on the emotional or functional implication of the element.

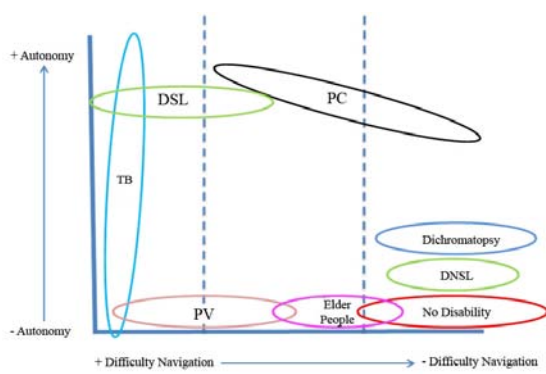
This interview method departs from a Socratic model, so the user always freely chooses the elements that he or she is going to evaluate. This way, as soon as the results of the sample are obtained, we can establish connections between spontaneous information. This factor significantly increases the reliability of the obtained information.

### 2.3 Phase 1. Results

The codification used in the results based on the disability of every user is:

- PP: Difficulties derived from physical problems.
- TB: Difficulties derived from visual problems (entire blindness).
- PV: Difficulties derived from visual problems (poor vision).
- DSL: Difficulties derived from auditory problems (deaf users who use sign language).
- DNSL: Difficulties derived from auditory problems (deaf users who do not use sign language).
- CG: Control group (persons without difficulties navigating the Internet).
- ED: Group of Experts in Disabilities.

Figure 1, shows the heterogeneity of the different disabilities in using the Internet, indicated by the difficulty level in navigating and the type of autonomy that the users have to use the computer.



**Figure 1:** Definition of the disabilities according to the type of Internet navigation

#### 2.3.1 Previous questionnaire results

We obtained information about the tools that the users use, do not use, want to use, or do not want to use; and of the types of requisites and needs that they would want to fulfilled with the creation of a virtual community.

From the following list of predefined items, an

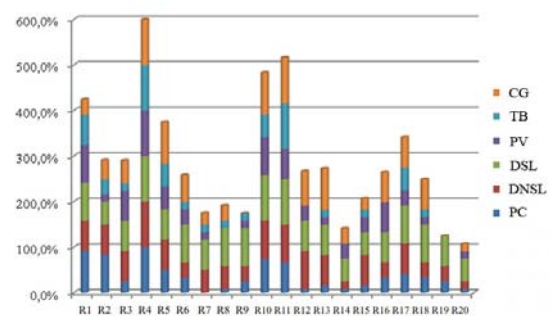
analysis was made and the information obtained is indicated by the following items and figures:

- Result 1: Customized navigator
- R2: Chat
- R3: Access to forums
- R4: E-mail
- R5: Information about health services
- R6: To request information or services from the public administration
- R7: Consultancy search
- R8: Job search
- R9: Search of contacts and friends
- R10: Files download
- R11: Consult news pages
- R12: Buy show tickets
- R13: Buy flight tickets
- R14: Supermarket shopping
- R15: On-line formation
- R16: Electronic banking
- R17: Technical help
- R18: To consult on subsidies or economic aids
- R19: Consulting my rights
- R20: To denounce

The following figures show the percentages of election of every item according to the type of stated disability.

#### 2.3.2 Tools used usually

User's emphasized the use of e-mail, news pages, files download or customizing the navigator for all types of users.



**Figure 2:** Previous questionnaire results

#### 2.3.3 Tools that users want to use but are not using at present

In this case, we found notable differences between the users: We emphasize the demand of information or information about health services raised by groups PP and TB. The users from PV and TB groups are more interested in access to forums, and finally the PP and TB groups are more interested in the use of chat capabilities. On the other hand, content regarding electronic banking or searching for work is raised only by the CG group.

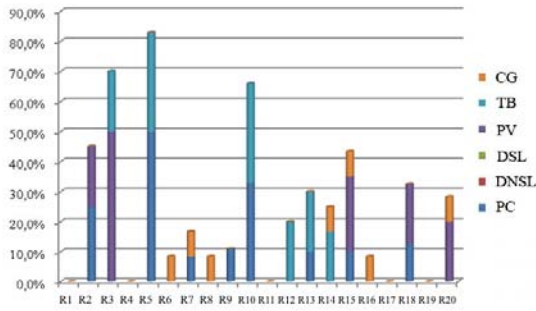


Figure 3: Previous questionnaire results

2.3.4 Tools that users do not want to use

The groups CG, PP and PV are those that least want to realize concrete options, especially the customized navigator, use of the chat, and search of information about steps to health.

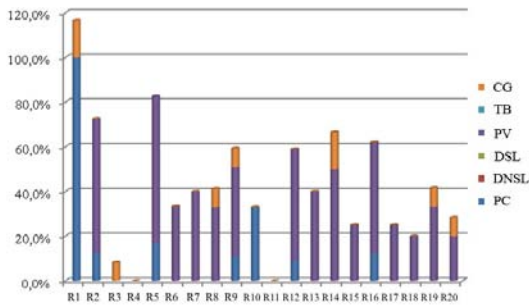


Figure 4: Previous questionnaire results

2.3.5 Satisfaction User Survey (SUS)

This system allowed us to obtain an indicator with regard to the navigation for a page AA, which helps to raise requisites to be borne in mind for the graphic and functional design.

The average obtained by user group in the navigation was as follows:

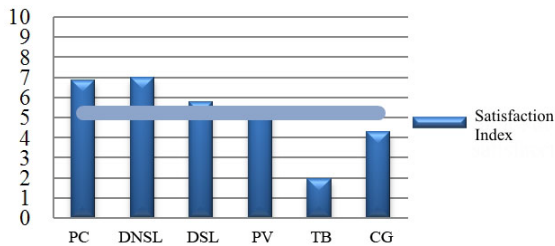


Figure 5: SUS Results

We emphasize the low evaluation of the group of TB because it does not correspond to the evaluation of accessibility of the page (AA) that principally covers this type of group and the punctuation of the group of PV.

2.3.6 BLA interview results

The results that we will show next are extracted from the analysis of the BLA. This analysis

emphasizes the spontaneous creation of elements by the users, and was analyzed according to the similarities with other users and other groups.

In the section “Description,” we find the elements or created sections. The C# code indicates that it is a common element – that is to say, it was mentioned spontaneously by several users. The percentage that appears in every element indicates the index in which every element was repeated.

The results of the BLA differ in positive and negative elements. The positive elements are those that the user understands how a strong point of the web, the negative elements, there will be everything opposite.

Next we show the common positive elements obtained.

Table 1: Mention index for the different user groups

Description	GC	ED	DF	DV BV	DV CT	DA SN	DA SS	TOTAL %
C1 Color	3,9	0,0	2,0	2,0	0,0	0,0	0,0	7,84
C2 Images	9,8	2,0	9,8	3,9	0,0	2,0	5,9	33,33
C3 Easy contact	7,8	0,0	3,9	0,0	0,0	3,9	0,0	15,69
C4 General Index	5,9	2,0	5,9	0,0	0,0	9,8	0,0	23,53
C5 Disability design concept	5,9	0,0	9,8	3,9	3,9	0,0	3,9	27,45
C6 Search	3,9	2,0	0,0	0,0	0,0	2,0	0,0	7,84
C7 A lot of information	0,0	3,9	3,9	3,9	2,0	2,0	0,0	15,69
C8 Links	0,0	3,9	0,0	0,0	2,0	0,0	0,0	5,88
C9 All information in the 1st page	2,0	0,0	2,0	0,0	0,0	0,0	0,0	3,92
C10 Customized information in function of the size	0,0	2,0	0,0	2,0	0,0	0,0	0,0	3,92
C11 Possibility to change color and size font	0,0	2,0	0,0	2,0	0,0	0,0	0,0	3,92
C12 Good Design	2,0	0,0	0,0	0,0	0,0	0,0	0,0	3,92

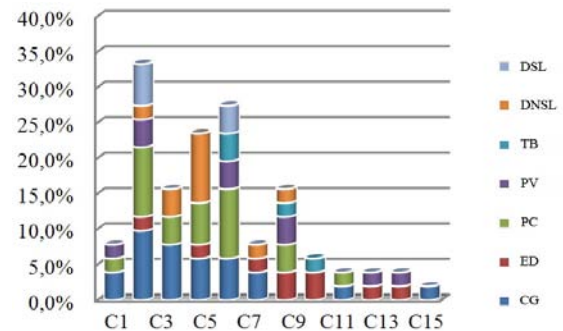


Figure 6: Mention index for groups of every element

The CG group does not bear in mind the elements C10 and C11, which are those who contemplate the functionalities of accessibility of the web page, because they do not value it and do not use it; therefore, they do not need it.

The group of Experts centers on the elements that somehow facilitate the navigation of the users with disabilities: *Icons / images* (C2), *General Index of the web* (C4), *Links* (C8), *Restructuring of the information as the size of the screen* (C10) and

Option to change colors and fonts (C11).

The group of PP does not value the elements that facilitate the navigation to the blind persons or those with poor vision because they coincide for the most part with the elements that the control group mentions.

The group of PV is present in the evaluations of the visual elements, C1, C2, C10, and C11, because they are very interested in being able to adapt colors or size according to their needs.

The group of TB does not comment anything on the visual elements and they center on the content: *Page concept for disabled* (C5), *A lot of information* (C7). With regard to the format and the structure, they do not emphasize any comments either.

The group of DNSL does not value the accessibility elements for blind persons and only mention that they like that there are images. The majority alludes to the general index of the web, since this allows them to go straight to what they are looking for without the need to read the whole content.

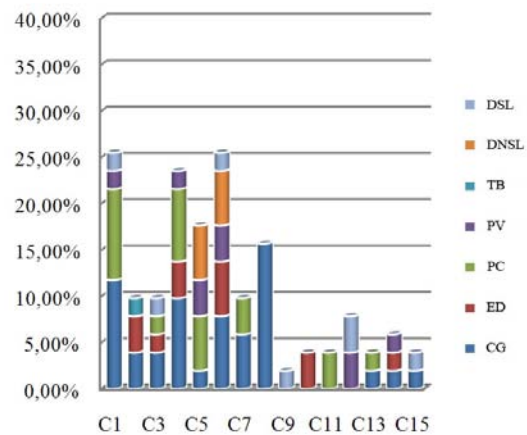
The group of DSL as DNSL the most interesting thing is to find images (C2) in front of the text.

Next we show the common negative elements that the users named:

**Table 2:** Mention index for the different user groups

Description	GC	ED	DF	DV BV	DV CT	DA SN	DA SS	TOTAL %
C1 Long scroll	11,76	0,00	9,80	1,96	0,00	0,00	1,96	25,49
C2 A lot of text	3,92	3,92	0,00	0,00	1,96	0,00	0,00	9,80
C3 Resolution	3,92	1,96	1,96	0,00	0,00	0,00	1,96	9,80
C4 Text size and contrast	9,80	3,92	7,84	1,96	0,00	0,00	0,00	23,53
C5 Color	1,96	0,00	5,88	3,92	0,00	5,88	0,00	17,65
C6 Untidy information	7,84	5,88	0,00	3,92	0,00	5,88	1,96	25,49
C7 Poor design	5,88	0,00	3,92	0,00	0,00	0,00	0,00	9,80
C8 First negative impression	15,69	0,00	0,00	0,00	0,00	0,00	0,00	15,69
C9 Few images	0,00	0,00	0,00	0,00	0,00	0,00	1,96	1,96
C10 Short Keys	0,00	3,92	0,00	0,00	0,00	0,00	0,00	3,92
C11 Low Data	0,00	0,00	3,92	0,00	0,00	0,00	0,00	3,92
C12 Contrast	0,00	0,00	0,00	3,92	0,00	0,00	3,92	7,84
C13 Problem with search	1,96	0,00	1,96	0,00	0,00	0,00	0,00	3,92
C14 Long and complex main page	1,96	1,96	0,00	1,96	0,00	0,00	0,00	5,88
C15 Untidy design	1,96	0,00	0,00	0,00	0,00	0,00	1,96	3,92

The CG is the only group that mentions that the first impression is negative and does not mention anything on the elements C9, C10, and C12, which refer to the accessibility elements.



**Figure 7:** Mention index for groups of every element

The group of experts centers on the elements that somehow facilitate the navigation of the users with disabilities.

The group PP has difficulties moving around the page: the page is very extensive and it is difficult to them to move with the scroll. They talk about the visual elements like the *Resolution / aspect of the icons* (C3), *Size letter and its contrast* (C4), *Colors* (C5), and *Archaic design* (C7).

The group of PV comments on the elements of contrast, colors, and size of the font.

In the group of TB, there is only one element that alludes to the excess of text.

The group of DSL mentions the visual elements C3, C9, and C12. They very much like the images and believe there would have to be more (C9), because this saves text, according to them. They are the only users who comment on it. In the particular elements, it is seen reflected that the persons with auditory disability find the vocabulary complex and do not understand Anglicism.

Finally, a lot of groups cited the element refer to the bad structured information (C6).

## 2.4 Phase 1. Analysis

The analysis was conducted bearing in mind all the results extracted by the different techniques used in this study.

Previously, another type of questionnaire was used with predefined items that allow us to obtain:

- Quantitative information on the profile of the users: studies level, work experience, where and how did they learn to navigate the Internet.
- Information on the type of content to be searched for on the web; type of knowledge of the legislation; type of information that the user looks for.

- Information to help decide a functional design: type of tools that they use or that they want to use.
- Information on needs for devices, *hardware*, or *software* for comfortable navigation.

The analysis of the data allowed us to value the reliability of the information gathered by means of observation and the notes regarding the interaction of the users on an accessible page AA for the previous questionnaire.

The behavior and the reactions provoked by the achievement of the tasks allowed the creation of a satisfaction user survey (SUS) from which we obtained quantitative statistics by means of a numerical average based on an initially accessible page.

From predefined elements for the user, we recommend the use of the interview BLA as a generative tool that emphasizes the strong and weak points marked by the proper users and being related between themselves in comparative to all the results. Thus the existing integration is revealed between the disabilities.

The integration of several techniques allows us to obtain several dimensions of the user's experience.

## 2.5 Phase 1. Conclusions

The main conclusions of the study are:

- We can observe that the rules of web accessibility AA only bear in mind programming requisites; they demonstrate needs for graphic design, functional design, and content. The heterogeneous needs of the disabilities are not borne in mind and we obtain a low satisfaction reported by users with visual disability.
- The integration of different methodologies allows us to obtain conclusions by the questionnaires and results raised and created by the users giving higher levels to the subjective experience during the test.
- The structure of the page must allow the access and the personalization of its content, depending on the profile of the user.

The base of the functional design is not realized from the accessibility rules. The work base is the information provided by the analysis. This investigation-line allows us to value the accessibility from the user's experience and not only from the technical requisites established by the WAI rules.

## 3 DESIGN OF AN ACCESSIBLE VIRTUAL COMMUNITY BEARING IN MIND THE RESULTS OF THE FIRST PHASE

Next, there appear some of the points that were changed according to the results of the evaluation by means of the user's tests and the criteria of accessibility as the result of the evaluations realized in the first phase:

- Decrease the scroll. (Remarked on by the group of physical and cognitive disability).
- Improve the quality of the images. (Remarked on by deaf users who use sign language.)
- Elimination of the images only like metaphor. (Remarked on by deaf users who use sign language.)
- Change of the quantity of text. (Short and long version of the text, it remarks by all the groups).
- Segmentation of the information. (It remarks by all the groups.)
- Incorporation of direct access to the sections and access to specific content for every section. (It remarks by all the groups.)
- Incorporation of dynamic content. (It remarks by all the groups)
- Improve the contrast between the background color and the color of the text. (It remarks principally by the group with poor vision.)

### 3.1 Phase 2. Test

The target of the test in this phase is to evaluate the web page of the virtual community by means of a tasks test, to value the use experience. The results will be obtained with regard to 12 users with disabilities.

For this second phase of the study, we chose to reduce the users' typology (groups), since on the one hand we can group the users' usuarios behavior as previously separated (for example, in case of deaf sign language users or non-users in their experience of web navigation, and we can affirm that their behavior did not change or has minimal changes that can be grouped)

#### 3.1.1 User Profiles

Three user profiles were considered in this second phase:

- PP: Four users with physical and cognitive disability.
- DV: Four users with visual disability (entire blindness and poor vision).
- DSL: Four deaf users who use sign language.

### 3.1.2 Task test

The tasks test was designed to observe the different behaviors of the users in the use of the page of the virtual community, bearing in mind the following points:

- Obtained information: Success, failure, false success, or false failure; and time of achievement.
- Remarks: Notes of the difficulties, unusual behaviors, or illogical errors.
- Behavior: Actions taken by the user that allow understanding for the achievement of the task.
- Literal: Subjective opinions about the experience and the interface, as expressed by the users.

All the tasks were read by the facilitator to help the users understood the questionnaire.

### 3.2 Phase 2. Results

The users who took part in the second phase had to complete seven tasks at different difficulty levels to verify the grade of adaptation of the new design. Most of tasks were solved successfully for any profile. We found an especially good adaptation of the page to the profile PP.

**Table 3:** Phase 2 data Tasks

	PC		DSL		TB	
	Success %	Failure %	Success %	Failure %	Success %	Failure %
Task 1	100,00	0,00	50,00	50,00	100,00	0,00
Task 2	100,00	0,00	100,00	0,00	100,00	0,00
Task 3	100,00	0,00	100,00	0,00	50,00	50,00
Task 4	100,00	0,00	100,00	0,00	100,00	0,00
Task 5	100,00	0,00	100,00	0,00	100,00	0,00
Task 6	50,00	50,00	0,00	100,00	0,00	100,00
Task 7	50,00	50,00	100,00	0,00	0,00	100,00
Average	85,71	14,29	78,57	21,43	64,29	35,71

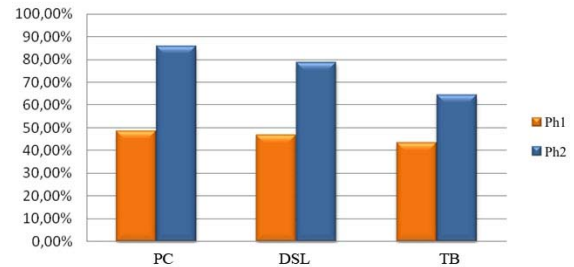
**Table 4:** Phase 1 data Tasks

Phase 1	Success	Failure	False Success	False Failure
PC	48,33%	40,00%	13,33%	0,00%
DSL	46,67%	53,33%	0,00%	0,00%
TB	43,33%	60,00%	0,00%	0,00%
Average	46,11%	51,11%	4,44%	0,00%

In the first phase of this project, the users had to complete a tasks test with the same target, verify

the autonomy of the user, and the correct adaptation of the page.

If we compare the results of success of two phases, we obtain:



**Figure 8:** Success Tasks. Phase1 vs. Phase2

When we compare the results of the success in the tasks for profiles of both phases, it remains clear that success in the tasks of the second phase is much more likely than for any other profile.

### 3.3 Phase 2. Analysis of results

From the obtained information, we can extract three big concepts that can help us to define the parameters that bring the navigation over to a satisfactory experience:

- Use of images and icons in the navigation, representation of paragraphs, and information.
- Concept of the design adapted for disabled people.
- A page with a clear general index, that is easy to use and return to it.

The obtained results confirm the need to generate a model of design that contemplates multiple test iterations to improve the accessibility of the web. The other result obtained is the increase of a good perception of the page.

This perception has been analyzed by means of observation, the protocol of clear thought (explaining thoughts during the navigation), and the spontaneous comments of the users.

In addition to the increase in the index of success, the users perceived the second web page more positively than the first one, or even valuing the first one as negative.

The perception of the page is radically different between the first and second phase, and this is due to the fact that in the first phase, it was not considered to be the user's experience. On having designed the second web page by means of accessibility patterns based on the user's experience, the perception and the efficiency of the page changes radically.

The application of the results of the first phase

in the design of the second web page is clearly positive.

The designs that focus on fulfilling the technical accessibility specifications do not manage to offer to the users an experience of satisfactory navigation without problems, giving like turned out low success indexes in the tasks and a negative perception on the part of the users.

On having introduced in the design an accessible web page pattern of experience of accessible user, we will manage to create a space in which the users can navigate more simply and effectively.

These designs generate highly successful results in the proposed tasks, a high positive perception of the page, and a desire on the part of the users to use it again to fulfill their needs.

In conclusion, the analysis of the results shows that to bear in mind criteria of accessible user experience gives very positive results in the use of the web. Also, it is necessary to emphasize that the automatic valuator are not tools with enough guarantees to assure that the web page is accessible for the final users.

#### 4 METHODOLOGICAL PROPOSAL

According to the information obtained in the two types of test and knowing the established type of validation of an accessible web page, we propose the following ratification cycle:

**Automatic validation:** The code of the page is validated through current evaluation tools. The result given is code lines to be resolved and points to be taken into consideration. This cycle is carried out until the page reaches the requirements established, thus obtaining at least an AA level of accessibility.

**Manual validation:** Validation is carried out by expert consultants who evaluate all the aspects in the layout of a web page: structure, functional design, graphic design, and adaptation to different user types. In this validation, usability is as much a consideration as accessibility.

This method resulted in several findings after evaluation, which suggests each point to focus on and a categorized sample of users to whom the web page is highly accessible.

**User validation:** In order to test user experience, a task-based test is carried out. In spite of taking in account the results from the automatic and manual validation, the user's test provide concrete information about potentially controversial aspects of the web page, findings regarding the problems of each user's profile and possible solutions to carry out.

**Establishing evaluation guidelines:** Once the web page has been analyzed, the norms of the guidelines to be followed can be established with the aim of creating an accessible web page with a

satisfactory level of user experience. All of the norms are created from suggestions or proposals made and aim to provide global solutions for the end-product. That is to say, the potential or future users of the web page are those who have actually contributed to the definition of the page itself.

#### 5 CONCLUSIONS

The most relevant conclusions of the study are the following:

- The objective of an accessible web page is that it provides a satisfactory level of user experience for those who use it.
- An experience deemed to be satisfactory to the user is mainly based on the user autonomy in navigating the Internet.
- The definition of a user profile is crucial when it comes to designing the test, given that deficiencies are very heterogeneous.
- In order to be able to draw significant data from the study, we really have to look at the implementation of different lines of methodology, which include those stipulated by the W3C (World Wide Web Consortium) or those found in the automatic validation process as well as those determined by study carried out new subjective techniques, which permit user expression.
- It is important that the perception of the page is positive in order for the user to be able to evaluate the accessibility of the web page. Accessibility is not based on a requirement to obtain an A, AA or AAA classification, but rather a requirement to provide the user with a satisfactory experience and to enable them to work autonomously (with or without deficiencies). In order to achieve this, testing carried out on handicapped, able, and elderly (with age-related deficiencies) users must be considered in the analysis of the study.

#### 6 FUTURE LINES

In order for web pages to be created with their future users in mind, content requirements, software architecture, graphic design, and structure must be considered. To do so, we are in the process of creating a standardized methodology that takes into account the sample of users and a combination of the techniques used in usability and user experience testing.

This methodology would allow us to give to any design team a tool to ensure that its final design will create a better experience on the accessibility framework for the users.

Also, it will be a good reference for other groups and ourselves to continue improving the way we evaluate accessibility and improve websites.

## 7 REFERENCES

- [1] Villegas, E., Pifarré, M., Fonseca, D. Garcia, O: Requisitos de integración en una comunidad virtual web para usuarios discapacitados utilizando la combinación de diferentes líneas metodológicas, 7ª Conferencia Iberoamericana en Sistema, Cibernética e Informática, Vol 3, Pags. 45-50, Orlando, USA (2008).
- [2] World Health Organization, Towards a Common Language for Functioning, Disability and Health: International Classification for Functioning, Disability and Health, Geneva: 2002<http://www.who.int/classifications/icf/site/icftemplate.cfm>].
- [3] Brooke, J. (1996). SUS: A Quick and Dirty Usability Scale. In: P.W. Jordan, B. Thomas, B.A. Weerdmeester & I.L. McClelland (Eds.), Usability Evaluation in Industry. London: Taylor & Francis.
- [4] Pifarré, Marc, Bipolar Laddering (BLA), a Participatory Subjective Exploration Method on User Experience, Dux 07: Conference on designing for user experience, Chicago, USA (2008).
- [5] Mahoney, M.J.: Participatory epistemology and the psychology of science. In Gholston, B., Shadish, W. R., Neimeyer, R.A., Houts, A. C. (eds.): Psychology of science. Cambridge, Cambridge University Press (1989).