infoaccesibilidad

observatorio   disc@pnet

Accessibility

of **Spanish university web**

disc@pnet

Fundación ONCE

FEDER

ACCESSIBILITY OF SPANISH UNIVERSITY WEB

In little more than a year from now, recent legislation will require all Public Administration websites—as well as all other publicly funded websites—to meet the criteria for accessibility. Included among them are University websites, the contents of which fall considerably short of being fully accessible to all students.

The purpose of this report is to shows just how compliant a representative sample of Spanish university websites is in terms of meeting the basic conditions of accessibility. To that end, a novel approach was designed to include both the technical accessibility analysis based on the Web Content Accessibility Guidelines 1.0 drawn up by W3C/WAI as well as a usability and accessibility assessment based on feedback from the users themselves. Thus, the technical analysis, carried out by a team of experts in designing fully accessible web pages, has been complemented by an assessment in which users with varying types and degrees of disability provided feedback on the difficulties they found while navigating through the university web portals.

Introduction.

This report for the Info-accessibility Observatory, set up by the Discapnet portal to promote web accessibility for everyone, is the first in a series of studies on the accessibility of different types of web portals. The choice of Spanish university websites as the type for this initial report reflects how important it is for students, faculty, and researchers to be able to access the net without obstacles, whether in search of information or the growing number of services being provided on the net. The study was undertaken by the Department of Accessibility at Fundosa Teleservicios.

Before launching into the results, however, a word should be said about what is meant here by "web portal accessibility." It can be defined as a set of technologies, application rules and design which facilitates the use of websites in accordance with the guidelines of "design for everyone." An understanding of the basis underlying the concept of web accessibility can be seen in the following cases, offered for illustration purposes:

> ➢ Totally blind users may be using a screen reader to access browser content, either by hearing it read aloud on speakers or reading it with their fingertips on a Braille display.

> ➢ Users with poor eyesight, partial eyesight, or color blindness who use systems for magnifying the screen may need to enlarge the font size of the text, or may require higher color contrast between the foreground and the background.

> ➢ Users with limited motor skill ability in their hands may be unable to use a mouse, and thus access the net exclusively through the keyboard or a voice recognition program allowing them to navigate by giving voice commands.

> ➢ Deaf users may require text alternatives to multimedia sounds elements on the web page.

> ➢ There are also users whose Internet connections are very slow, or who connect through small-screen handheld devices such as PDA's and cellular phones who would benefit from accessibly designed websites.

On the net, just as in the brick-and-mortar world, any design that is heedless of accessibility issues creates needless barriers and hardships. In contrast, as Jakob Nielsen points out in his book *Usability in Website Design,* an accessible design is closely related to the overall usability of the site, and enhances the effectiveness, efficiency, and satisfaction of their experience for all users regardless of any functional limitation they may have.

Legislation in Spain has tried to promote criteria that foster universal accessibility. The **Constitution**, drafted in 1978, designates one of the State's responsibilities as that of "*promoting the conditions so that freedom and equality for the individuals and the groups to which they belong are real and effective; removing the obstacles that impede their fulfillment, and facilitating the participation of all citizens in public, economic, cultural, and social life*" (art. 9.1). Much more recent legislation includes efforts to guarantee full accessibility to the web. Such is the case with **Law 34/2002 of July 11 on Services of the Information Society and E-business**, the Fifth Additional Disposition of which sets the deadline at December 31, 2005 for all Public Administration and otherwise publicly funded websites to be accessible. Similarly, **Law 51/2003 of December 2 on Equal Opportunity, Non-discrimination, and Universal Accessibility for the Handicapped** states in its Final Seventh Disposition the basic conditions for accessibility and non-discrimination in accessing and using the technologies, products, and services related to the Information Society and social communication media, with deadlines ranging from two to ten years, depending on the type and origin of the information concerned.

The European Union has also initiated measures regarding website accessibility, including the European Parliament Resolution on Communication from the Commission "**e-Europe: accessibility of public websites and their content**" (April 2002), which advocates developing an internet accessible to all citizens. Point 32 of the Report to the European Parliament on the Communication of the Commission of Industry, Foreign Trade, Research, and Energy of April 24, 2002 underlines that "for websites to be accessible, it is essential that they meet the double-A level, and that they fully comply with all the verification points of priority 1 and 2 from the WAI Guidelines."

Other studies have been done on the accessibility of university websites. C. Egea García's "Server Accessibility in the Public Administration" (1998) used a sample including three Spanish university websites (the Complutense of Madrid, and the General Studies of Valencia and Murcia) and showed that none of the three met even minimum requirements of accessibility. Later, a 2002 study by M. Térmens, Ribera, M. and Sulé, A. titled "Level of Accessibility on Spanish University Websites" found that there was still much ground to be covered, given that only 16 of the 256 pages analyzed complied with the minimum requirements.

Sample Selection.

The basic criteria for selecting the sample of Spanish university web portals used in this study are based on the need to reflect both its relevance for the student as well as the diversity of the educational sector: differences in institutional size, location, public or private, on-campus vs. distance learning, etc. With these factors in mind, the selection was made of:

> ➢ The seven largest universities in terms of enrollment (more than 50,000, all public, one giving distance learning).

> ➢ Four mid-sized universities (enrollment between 15,000 and 50,000 students; three public and one private distance learning college).

> ➢ Two small universities (fewer than 15,000 enrolled; both private).

The criterion for variety in geographical location is met, since the sample is spread out among 8 Autonomous Regions, both single-province regions as well as regions consisting of various provinces, of differing size and population density.

In terms of student enrollment, the university portals selected represent 41.6% of all Spanish university students enrolled in the 2002-2003 academic year (619,555 students).

In addition to the portals of the universities themselves, it was considered valuable to include two websites hosting general-interest university information. Thus, both the Council of Rectors of Spanish Universities (CRUE) portal as well as the Ministry of Education's University Information (MECD) website were included in the sample.

Table 1 shows the selection of portals used in this study, with relevant data for their inclusion in the sample.

Table 1- Portals making up the sample in this study

UNIVERSITY PORTALS				
University	**Abbr.**	**Sector**	**Enrollment**	**Region**
Universidad Nacional de Educación a Distancia[1]	UNED	Public	128,729	National
Universidad Complutense de Madrid	UCM	Public	88,216	Madrid
Universidad de Sevilla	USE	Public	67,365	Andalusia
Universidad de Granada	UG	Public	58,009	Andalusia
Universidad de Barcelona	UB	Public	57,219	Catalonia
Universidad del País Vasco	UPV	Public	51,665	Basque Country
Universidad de Valencia (Estudios Generales)	UV	Public	50,896	C. Valenciana
Universidad de Valladolid	UVA	Public	31,232	Castilla y León
Universitat Oberta de Catalunya[1]	UOC	Private	23,868	Catalonia[2]
Universidad de Las Palmas de Gran Canaria	ULPGC	Public	20,837	Canary Islands
Universidad de Alcalá de Henares	UAH	Public	18,808	Madrid
Universidad de Deusto	UD	Private	12,050	Basque Country
Universidad de Navarra	UN	Private	10,661	C. Navarra
GENERAL REFERENCE PORTALS				
Name				**Abbreviation**
Council of Rectors of Spanish Universities				CRUE
University Information, Ministry of Education, Culture, and Sports				MECD

[1] Universities offering distance learning degrees.

[2] The Universidad Oberta de Catalunya offers study programs outside the Catalonia Region but, unlike UNED, it does not host any support centers outside Catalonia.

Checking for accessibility: technical aspects and user feedback.

Consultants on accessibility and usability from Fundosa Teleservicios carried out a technical evaluation of accessibility based on a twelve-point checklist synthesizing the levels of compliance with the Web Content Accessibility Guidelines 1.0 (WCAG 1.0) proposed by W3C/WAI. These twelve points mostly include priority 1 aspects from the Guidelines, although some also come from other levels of priority.

The procedure for checking compliance required employing manual and heuristic tests as the only valid approach to verify essential qualitative features such as understandable links, or the correct use of ALT labels and TITLE tags. Some tools such as the TAW Test for Web Accessibility were expressly discarded due to their orientation toward web page designers rather than for evaluating university portals and other large corporate websites.

The web pages were visited using the most widely used graphic internet browsers: Microsoft Internet Explorer 6.0, Netscape Navigator 7.0, and Opera 7.2. Some features were deactivated during browsing in order to check some of the points being tested, such as style sheets and scripts.

The technical evaluation of accessibility sampled an average of six web pages per portal. Pages were chosen to match the following profile:

1. **Presentation, greeting, or language choice page** (when available): It may have hardly any content but it could pose a barrier to accessing the site if it does not comply with accessibility criteria.

2. **Home page:** the portal's most complex page, the way to get familiar with the contents and a standard step to the other sections.

3. **Site map:** to find your way around the site and access other contents.

4. **Data table:** an often-used way of laying out information.

5. **Forms**: standard way to enter data for a variety of tasks (sending suggestions, searches, even for course registration).

6. **Download page:** a place students use to access contents, often academic.

7. **Search results page:** displays returns on searches for further content.

The technical verification process was carried out during the period from August 5 to August 30, 2004.

Fundosa Teleservicios concurs with the W3C/WAI recommendations that the results of a technical evaluation of accessibility should be complemented with an assessment based on feedback from users who have different conditions of ability and disability. This approach is based on the ISO 9241 quality standard, which defines usability as "*the effectiveness, efficiency, and satisfaction with which a product allows specific users to reach specific objectives in a specific context of use.*"

User-centered assessment provides the means to check the "information architecture," i.e., how the information is organized (classified, and labeling); how it is retrieved (navigation, search, and orientation systems), and how it is structured for interaction (definition of the interaction processes with the system).

The procedure used in this study is based on a User Feedback Test styled as a self-administered questionnaire[1] composed of a set of tasks and subsequent questions to be filled in by the user following prior instructions.

The sample of users who took part in the assessment survey was made up of individuals with limited abilities of different kinds. They used different kinds of technical aids for navigating and displayed different levels of technical skill. Table 2 shows the profile of each of the 6 users who took the assessment test.

Table 2- User profiles in the assessment test

Functional limitation	Technical aid used
Greatly reduced mobility of the hands	Trackball and head wand
Deafness	None used
Blindness	JAWS screen reader
Blindness	JAWS screen reader
Reduced eyesight	Screen resolution of 800x600
No notable limitation	None used

As in the technical evaluation, the results from the user feedback questionnaires were collected, tabulated, and interpreted by experts from Fundosa Teleservicios. The tabulation compares and weighs the users' feedback along with the objective results from the test tasks on each portal by their efficiency, effectiveness, and satisfaction. As an additional complement, the users were then organized into a

---

[1] The questionnaire, filled out by users after doing 5 tasks on each university portal, consisted of 10 questions per portal, in which the user was to answer by rating each point on a scale of 1 (low) to 5 (high).

discussion group to go over their experiences. The tests were carried out over the second week of September.

Analysis of the results of the technical evaluation of accessibility.

The following results were obtained from the technical evaluation of accessibility for each of the 12 criteria chosen for this study.

1. Validation of W3C technologies (priorities 1 and 2 in WCAG 1.0).

Both the HTML code and the Style Sheets (CSS) used on the pages should be correctly expressed and validated by formal grammars, in this case according to HTML and CSS specifications[2]. Any errors in the code make rendering the page different depending on the browser used, since not all browsers support all features.

The validation done for the study found code errors on all 84 pages in the sample. Thus, none of them were in compliance of this criterion.

2. Frames (priorities 1 and 2 in WCAG 1.0).

It is not currently necessary to depend on frames to define the structure of a website. If the frames option is chosen, their names should be meaningful regarding their content, the relationship between them should be clear, and an alternative should be given for users whose browsers do not support frames.

Seven of the fifteen portals analyzed used frames. Three of them did so constantly (UCM, USE, and UPV), and four made occasional use (CRUE, UB, UAH, and UVA). None of them offered a title or description to guide users. As a result, none of the pages complied with the accessibility requirements for frames.

3. Forms (priorities 1 and 2 in WCAG 1.0).

The trouble some users may have when presented with forms includes not knowing what data to enter or select in each field owing to the form's incorrect structure if the control tags are not arranged properly; not being able to select and send data due to some browsers' incompatibility with Javascript; not being able to tab through the forms in the right order; or not finding the data arranged by topic or concept on large forms.

None of the portals analyzed were found to comply with the requirements for accessibility. The most frequently committed error was the lack of correspondence in code between each tag and its control, which caused great hardship especially for the people who navigate with screen readers. Putting the tag on the left or above each control makes rendering forms easier for tech-aided navigation. This occurred on seven of the portals: MECD, UNED, UB, UPV, UV, ULPGC and UN.

4. Text alternatives for multimedia items (priorities 1 and 2 in WCAG 1.0).

Some users can not see images (i.e., the blind, people using text-only browsers, those who cancel downloads of pictures because their internet connection is slow, etc.); others can not hear sound files (the deaf, people who have no sound

---

[2] W3C provides both tools for validating code. For HTML, see http://validator.w3.org. For CSS2, see http://jigsaw.w3.org/css-validator/

card on their PC, etc.). For them, it is essential to provide some text-based alternative to multimedia files.

The sample sites were checked to see if multimedia items also had text alternatives for people who could not access them, and to verify that the text alternatives found were adapted to the real needs of different user profiles.

> On all the portals in our study we found multimedia items without any text alternative describing the image file. Nevertheless, the most relevant images on some of the web pages on the UV, USE, and UGR sites did have an alternative.

5. Headers (priority 2 in WCAG 1.0).

Headers (also known as "section titles") are a fundamental way for a website to mark the information structure on each page. Headers should correctly indicate the level of depth: a level 1 <H1> header should not be followed by a level 3 <H3>. Browsers such as Opera or JAWS screen readers use headers to let users move around the page, a useful feature for the blind and people with limited motor skills. This study checked to see if headers were present, and if they were used correctly.

> None of the portals analyzed complied with this criterion for accessibility. Most did not make use of header tags; they were only found on the UV site, but even then they were used incorrectly (an H1 led to an H3, for example).

6. Relative units in Style Sheets (priorities 1 and 2 in WCAG 1.0).

Some people may need to be able to change the size of the text on pages they visit in order to read the contents. Changing the font size requires using either relative units <em> or percentages (%), and should be stated in the Style Sheets being used. Letter size, however, cannot be changed if absolute units (in points, centimeters, or pixels) are used in Style Sheets.

> None of the pages in the sample used relative units in their style sheet statements. Thus, none fulfilled this requirement, thereby making it impossible for users with impaired vision or trouble moving the cursor to change the size of the font.

7. Understandable links (priorities 1 and 2 in WCAG 1.0).

Links are an important structural item in a website, since they let users navigate between pages and choose the content they want to access. Texts and /or images used for a link should be self-explanatory: they should give a clear indication of where they lead to once clicked on. Some web browsers allow users to display only text (or text alternatives to images); out of context, the link should still make sense (for example, merely stating "click here" is meaningless). The study also checked to see whether links to downloading documents showed what format the target file is in.

> Most of the links in the sample were indicative of their content. Nevertheless, some pages were found to have image links with no text alternative, while others had links with unhelpful text. Overall, this requirement reached a considerable degree of compliance, especially on the UV and USE portals.

8. Contrast (priority 2 for images in WCAG 1.0).

Some people can not view colors correctly, which makes it hard to read the text on screen. For that reason, there should be enough contrast between the text and the background color. In order to verify this criterion, grayscale monitors were used to view the pages, and the foreground image/background color contrast was scored (priority 2) without quantifying the contrast between font color and background (priority 3).

> On the whole, the sample pages showed enough contrast between images and background color, though the UOC and UNED portals were found to have poor contrast between text and background color.

9. Semantic use of colors (priority 1 in WCAG 1.0).

Information conveyed by color on web pages should also be available without color, as through context or markers. For the totally blind and the colorblind, this accessibility requirement is vital. For other people such as the learning disabled, the use of color can aid navigation, but it should be done using the right context and markers (for example, in style sheet statements).

> None of the pages analyzed in our sample made use of color to convey information. As a result, they all scored favorably in terms of accessibility, since users unable to distinguish colors faced no trouble in this respect.

10. Aligning content with tables (priority 2 in WCAG 1.0).

When tables are used for web page layout purposes (even though nowadays we recommend using layers to lay out content), the content should remain properly aligned when text-only browsers or screen readers are used. Otherwise, serious problems may arise for rendering the page contents.

> Of the 15 portals reviewed, only the UOC portal had its contents correctly laid out with tables. Errors in the remaining portals in some cases surpassed the 50% mark.

11. Data tables (priority 1 in WCAG 1.0).

The blind or visually impaired may find it extremely complicated to understand how data interrelates when put into tables with one or more categories. Tables should always show headings for each column or row, and use markers to associate header cells with their data cells in tables involving two or more logical levels of headings.

We found some tables that did not display row and column headings (which also affects their usability), and others that, while showing headings for rows and columns, did not mark them as such by means of code.

> In the sample analyzed, no table was found to meet the required criterion for accessibility.

12. Scripts (priority 1 in WCAG 1.0).

Care should be taken so that no functionality is lost when using programming objects such as scripts should for any reason they not be activated. Some browsers, such as Lynx, do not support scripts; others may not have scripts

activated because of the device being used or the user's lack of skill. In such cases, it is essential to offer an alternative.

Of the portals analyzed, this requirement for accessibility was met successfully by those of UCM and USE.

As an overview, Chart 1 shows how each portal in our study scored in percent compliance with the 12 indicators used in the technical evaluation of accessibility:

Chart 1

Classification of portals analyzed for accessibility, in percent compliance

Clasificación de los portales analizados por grado de accesibilidad, en porcentaje
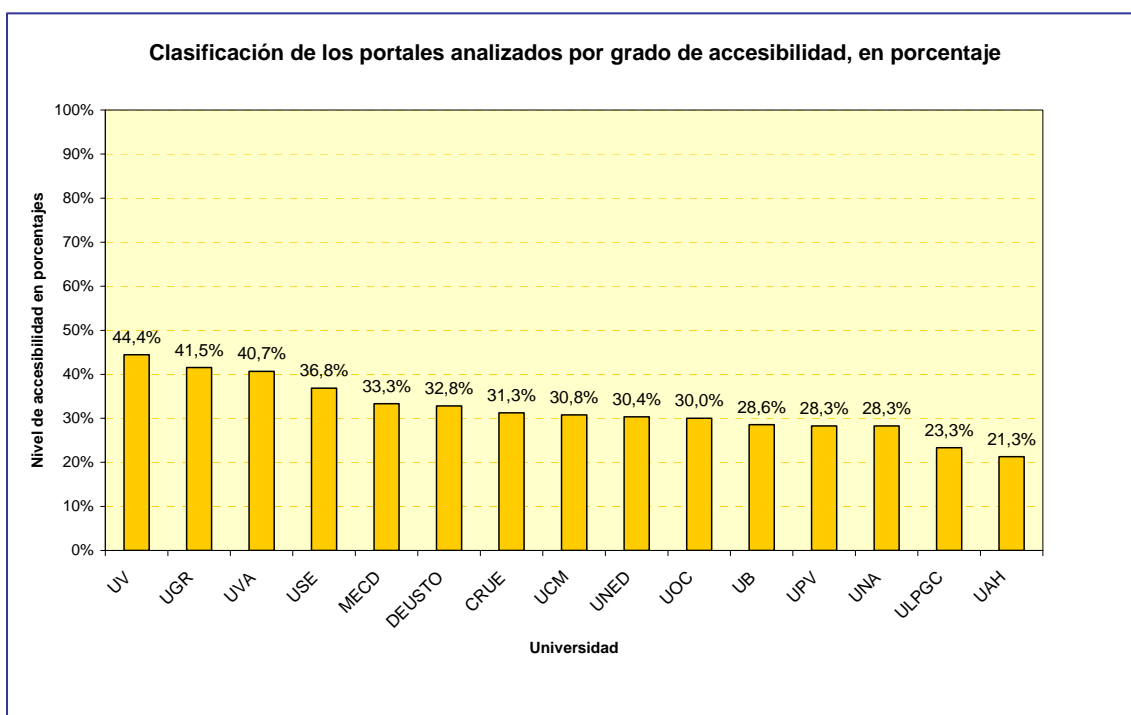
The most significant fact is that none of the university portals managed to reach even a 50% compliance with the basic requirements for accessibility sued in this study. In other words, none of them can be considered to have passed the test. Clearly, there is considerable work to be done.

The average compliance of the accessibility indicators is **32.11%**, with 6 portals above average and 9 falling below.

When viewed in terms of the size of the university, schools with higher enrollment fared better on accessibility. Four of them are above the average, and the three others are close to it.

The three private universities are scattered in different positions in the compliance ranking, which suggests no difference with publicly run universities.

Both universities offering distance learning fall short of the average. This fact is particularly relevant considering that students use the web for online information much more often than in on-campus educational settings.

The scores of the two general reference sites fall just below the average for the sample, revealing a poor level of compliance (MECD at 33.3% and CRUE at 31.3%).

Of all the portals analyzed, the one attaining the highest score on accessibility by the criteria used is the University of Valencia General Studies (at 44.4%); at the other extreme, the University of Alcalá de Henares comes in last place (at 21.3%).

Analysis of the results from the user feedback survey

A particularly novel part of our study involved assessing the accessibility and usability of the portals based on feedback from users with and without disabilities. This section was carried out by means of a task to be done by a variety of users with different ranges of ability and functional limitations. The hands-on approach of having users browse through and use a web portal helps identify any factors they perceive as facilitating or hindering their use.

The users in our study carried out a series of five pre-designed tasks per portal. After completing each task (or giving up for whatever reason), each subject filled out a questionnaire consisting of 10 questions on a scale of 1 to 5 to indicate the user's level of success and satisfaction on performing each task. In addition to the user's satisfaction expressed on the questionnaire, the results were weighed for efficiency and effectiveness in performing the tasks. A low score (1) means the task was impossible to accomplish and/or the lowest level of satisfaction. At the other end, a high score (5) indicates the greatest degree of accomplishment and/or satisfaction. The middle score (3) was used as the cut-off for a web page to pass the test. Users were also encouraged to add their own comments on the questionnaires to clarify any point. Finally, a discussion group was held to go over their experiences together.

Table 3 shows what aspects were found to be helpful to navigation and what were obstacles that hindered or completely impeded using the websites. They are arranged according to the kind of limitation each user had.

Table 3. Aids and barriers to navigation

|	IMPEDIMENTS	OBSTACLES	Aids
Visually Handicapped (the blind)	No text alternative to images directly related to performing a task.	Decorative images with no alternative text.	Correctly tagged links and images.
	Mislabeled links for performing a specific task (i.e., mislabeled search button).	Displaying search results with web strings from the website hosting the search result. This creates confusion and does not give a clear idea of what the website is about.	Correct verbalization of the controls for forms with a screen reader. (Correct association of controls and labels)
	Controls on forms are incorrectly verbalized by screen readers. Incorrect association of text labels with controls (editing boxes, drop-down lists, etc. in the form).	Search engine malfunction.	Providing accessible alternatives to otherwise inaccessible documents.
	Using frames without title or content.	Not titling the search results page as such.	Specifying search results.
	Use of non-accessible FLASH technology without an accessible alternative.	Search engine results not done by section headers or titles to show more accurate matches.	Providing an accessible map of the website.
		Poorly structured information.	Relevant information with pre-assigned keyboard shortcuts.
		Pages with automatic page refreshing, since screen readers reset the cursor to the beginning of the refreshed page.	Using accessible Flash technology.

	IMPEDIMENTS	OBSTACLES	Aids
		Opening new windows without warning users that they are on a new page.	
Visually impaired	Errors upon loading the page (large image files).	Large numbers of pop-up windows on different topics.	Pop-up windows with additional information on the corresponding link.
	Trouble viewing the page with high-resolution screens (e.g., 800x600).	Strange and oddly-placed menus.	Clear, concise information on the portal home page.
	Very small menus and texts.	Choosing a different language does not display the same content.	Menus are always visible throughout the site.
	Information is lost at higher screen resolutions.	Poorly indicated search bars.	Well-running search engine. Well-organized and structured results.
	Non-functioning scroll bars, usually making the bottom of the page unviewable.		
	Not being able to resize the page.		
Hearing impaired	Text-heavy pages, too many links, and repeated use of unexplained abbreviations to denote sections.	Images with no text alternative to show what the purpose of the image is.	Simple, practical names for links.
	Pop-up menus that hide the information underneath.	Search engines with few search options, making it hard to find specific information.	Providing a site map or outline of the links.
		Using complicated vocabulary or terms.	Outlines arranged in list form.
		Not respecting the language chosen when entering the site despite having selected it beforehand.	Intuitive pages with drop-down menus on the same page without adding to download time.
Motor-skill impaired	Not being able to access all the content by keyboard input.	Drop-down menus requiring fine-honed precision to use them.	Fast, intuitive navigation.
	Mislabeled links; links with confusing names.	Poorly indicated search engines.	Clear labels.

On the whole, the insights gleaned from the user feedback tests reveal the troubles they had when trying to perform the assigned tasks. Some of the problems were considerable obstacles—particularly for the blind—and were only overcome by great effort and imagination, as was the case when advancing through incorrectly labeled links. Still, the overall assessment was positive for accessing most of the content while highlighting aspects that can be improved or fixed for better navigation.

The highest score users could give each portal was 50 points. The total score obtained by adding up the 6 users scores (making 300 points the highest possible score) was re-scaled to 0 to 100 points, and the theoretical cut-off set at 50.

Chart 2 offers the results obtained from the user feedback survey.

Chart 2

Global scores (adjusted) of portals in the User Feedback survey

Puntuación global de portales en la Experiencia del usuario
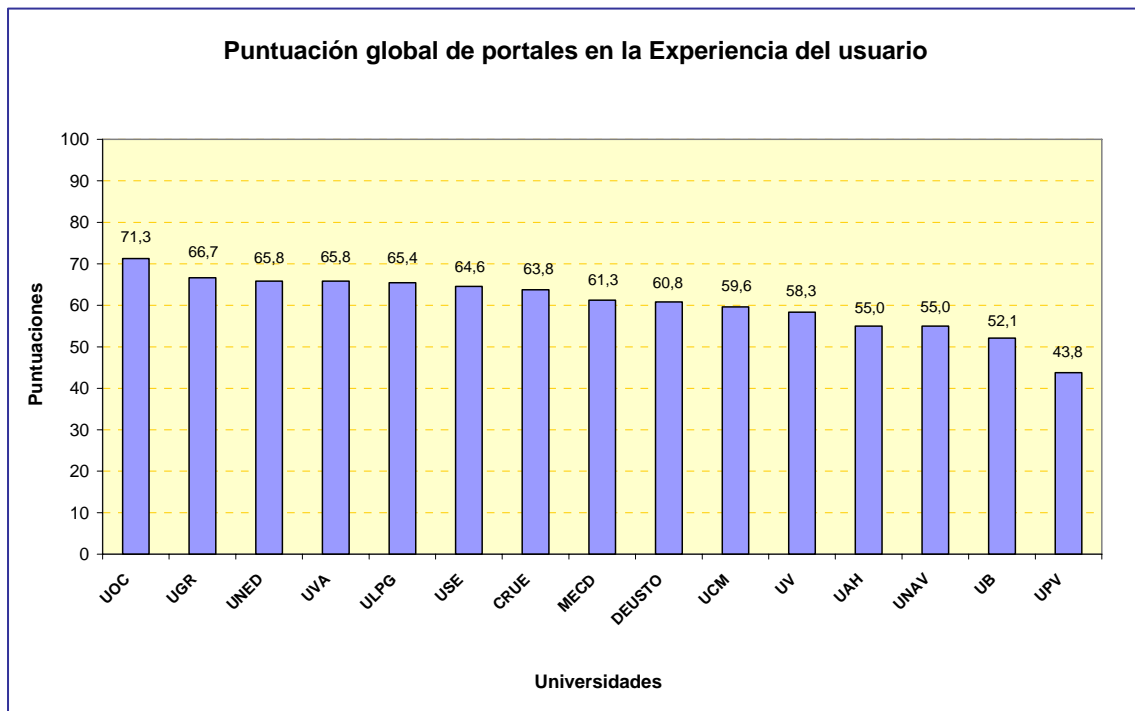
On the whole, user assessment of the university portals was more generous than the Fundosa Teleservicios experts' technical evaluation of accessibility. The average score on a scale of 0 to 100 was 61 points, and every portal except the University of the Basque Country scored above the 50-point cut-off for passing. These more favorable results from the feedback are deemed to owe greatly to the users' adeptness and perseverance at navigating through websites fraught with obstacles. This skill helped them carry out the tasks assigned, though at the cost of having to invest greater time to do so. Another reason for the comparative difference is that the low scores given by some users were compensated by high scores given by others depending on what kind of limitation each user faced. The score from the user without any handicap or limitation did not substantially change the overall score, even though his partial scores were on average slightly higher than the scores from users with some kind of handicap or limitation. In any case, from the users' point of view, the web portals of Spanish universities need considerable improvement if certain groups of users with functional limitations are to be able to access their contents.

The university portal receiving the highest user rating for accessibility and usability was the UOC site, while the UPV took the lowest score by a considerable margin (27 points).

The kind of problems users ran up against while carrying out the tasks varied according to each user's own functional limitation. Therefore, a fully accessible and usable website needs to take all the criteria into account if it hopes to reach all potential users.

Prior experience at navigating websites appears as the main factor for a user to be able to access a website's content, more than the technical characteristics of the page itself. Even so, the users who took part in our survey had to spend undue amounts of time to accomplish the task, time they said they may otherwise not bother to spend in a real situation. We have no reason to suppose that everyone interested in accessing the content of a website has had enough prior experience to dodge the difficulties revealed in this assessment.

Conclusions

The Spanish university web portals analyzed in this study showed a low degree of accessibility in the technical evaluation carried out by experts. None managed to achieve a 50% score in accessibility, and the worst ones fell below the 25% mark.

Nevertheless, compared to earlier studies on university web portals and accessibility, there has been some degree of improvement. In a study by Egea (1998), none were accessible, and in one by Termens, Ribera, and Sulé (2002) only 16 out of 256 pages sampled complied with minimum requirements of accessibility.

In contrast, user feedback scores were higher, at an average of 61 out of 100 points, with only one portal failing to make 50%. These higher ratings should be viewed bearing in mind that it was likely the users' own skill and perseverance, rather than the virtues of the technical features of the page design, that helped them complete tasks they might not otherwise do in the real world. Users pointed out a number of obstacles preventing or hindering access to contents, and stressed the need for the university portals under study here to improve their accessibility.

The University of Valencia General Studies portal headed the ranking on the technical evaluation of accessibility, with 44.44%. At the bottom of the list was the University of Alcalá de Henares, at 21.31%, a full 23 percentage points below the top.

The Open University of Catalonia, at 71.3 points, took top place on the user feedback assessment, while the University of the Basque Country came in last place, 27 points below, at 43.8 points.

If we convert the raw scores of the technical analysis to a scale of 0 to 100, and we add the points scored on the user feedback survey, we find that the highest scoring portal belongs to the University of Granada (108.18 points). Also above a hypothetical cut-off of 100 points are four other universities: Valladolid, Valencia, Seville, and Open University of Catalonia. Last place, at 72.01 points, is the University of the Basque Country.

Table 4 shows how each university portal is ranked by adding both assessments.

Table 4. Final ranking.

	UNIVERSITY PORTALS ANALYZED IN THE STUDY	Score out of 200[1]
1	University of Granada	108,18
2	University of Valladolid	106,51
3	University of Valencia General Studies	102,77
4	University of Seville	101,42
5	Open University of Catalonia	101,25
6	National Distance Learning University	96,19
7	Council of Rectors of Spanish Universities	95,00
8	University information from the Ministry of Education, Sports, and Culture	94,58
9	University of Deusto	93,62
10	Complutense University of Madrid	90,35
11	University of Las Palmas G. Canaria	88,75
12	University of Navarra	83,26
13	University of Barcelona	80,65
14	University of Alcalá de Henares	76,31
15	University of the Basque Country	72,01

[1] *Scores on a scale of 0 to 200, the result of adding the adjusted raw score from the technical evaluation of accessibility and the scores given in the user feedback survey.*

Our study reveals a number of unadvisable practices in the design of contents for Spanish university web portals which hinder, and occasionally prevent, people with limited functional abilities from accessing the page. Similarly, several points were found largely to comply with the criteria for accessibility on the aforementioned portals.

The most relevant design errors (either because of their frequency or the severity on accessing the information) were found to be the following:

- **Forms** that do not relate the tag to its control.

- Lack or inadequate use of **headers**.

- Scant use of **text alternatives to images** that convey pertinent information.

- None of the **data tables** on the portals analyzed complied with the criteria for accessibility.

- Seven portals used **frames** without adopting the criteria for accessibility.

- None of the pages had code that passed the **W3C validation technology**.

- **Relative units on Style Sheets** are not being used.

- **Programming objects such as scripts** are used without providing accessible alternatives.

- A number of **incomprehensible links**, often for images without text alternatives.

On the positive side, we can cite:

- All the portals showed **good compatibility with the three graphic web browsers** used in the study.

- **No semantic use of color** was found on the portals analyzed.

- Scores on **contrast between background and images** evaluated on gray-scale screens were favorable.
- **Using tables for content layout** surpassed the 50% mark on the technical evaluation of accessibility.

Table 5. Internet addresses of the portals evaluated.

UNIVERSITY PORTALS ANALYZED IN THE STUDY	INTERNET ADDRESS
Conferencia de Rectores de Universidades Españolas	http://www.crue.org
Información universitaria del Ministerio de Educación, Cultura y Deporte	http://www.univ.mecd.es
Universidad Alcalá de Henares	http://www.uah.es
Universidad Complutense de Madrid	http://www.ucm.es
Universidad de Barcelona	http://www.ub.es
Universidad de Deusto	http://www.deusto.es
Universidad de Granada	http://www.ugr.es
Universidad de Navarra	http://www.unav.es
Universidad de Sevilla	http://www.us.es
Universidad de Valencia Estudios Generales	http://www.uv.es
Universidad de Valladolid	http://www.uva.es
Universidad Las Palmas G. Canaria	http://www.ulpgc.es
Universidad Nacional de Educación a Distancia	http://www.uned.es
Universidad País Vasco	http://www.ehu.es
Universitat Oberta Catalunya	http://www.uoc.edu