Supporting Accessibility in Higher Education Information Systems: a 2016 Update

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Abstract

Higher Education Institutions (HEIs) have come a long way on the usage of Information Systems (IS) at the several phases of the execution of their business plan. These organizations are very peculiar in the sense that most of the IS technologies have been developed as a consequence of the research work of the HEIs, positioning them as creators and as consumers of IS technologies. In fact, a considerable part of the IS products, currently available for the education sector, was initially created in a HEI as an in-house development. For these reason, the adoption of IS technologies by HEIs has followed two distinct paths: the in-house creation, previously described; and a current market adoption, similarly to most other companies IS adoption.

Up to 2013 the IS applications for HEIs was mostly provided as web applications running on the HEI local datacenters and devoted to some specific phases of the HEI business plan. Currently, in 2016, this scenario has evolved in two ways: i) to a wider range of type of applications, including: the old type of web application; new mobile applications; and new web application, running on the cloud and used as a service. ii) to a more extended support coverage regarding the HEI business model phases, i.e., there are more IS applications supporting more aspects of the HEIs' activities.

In 2013, it was published a study regarding the accessibility support in HEI IS applications and related user practices. Due to the advances in IS technologies and their adoption by HEIs, it is now time to update this perspective on accessibility and HEIs IS, in order to assess how the progresses on IS applications used in HEIs have dealt with the accessibility concerns. The study updates the IS accessibility features as well as the new systems and new types of systems currently in use.

adfa, p. 1, 2011.

1 Introduction

In our previous work [1-2], we focused on the software systems used by the higher education institutions (HEIs) and how those systems coped with the accessibility requirements. The analysis was carried out by using the University of Trás-os-Montes and Alto Douro (UTAD) as a case study. UTAD, like most HEIs, has its business model and activities supported by several information systems (IS), most of which are used to produce and support content, e.g., the moodle learning management system (LMS), Microsoft sharepoint, joomla, wordpress, etc. We used a semi-automatic tool, the Total Validator [3], and did a general assessment of the sites, together with a bibliographic assessment of the features provided by each software system, used to support the sites. In our conclusions, we stressed the fact that all of these systems have the necessary features to create and support accessible content, thus, leaving to the content designers and creators the ultimate responsibility to address the accessibility issues in their content related practices. A proposal was issued regarding the adoption of rules to regulate the design and creation of content in order to assure some degree of accessibility compliance.

In this 2016 update, we opted to do an automatic analysis of the current sites, using the Sortsite tool [4]. We assumed that the software systems have the necessary features to comply with the accessibility issues and the assessment results are mainly a consequence of the content creators' practices.

2 Accessibility evaluation

The evaluation was executed using the SortSite (version 5) automatic tool, which was selected due to its advanced analysis features, providing a deep analysis, such as, general errors' evaluation, accessibility and usability guidelines compliance, etc. The usage of automatic tools has some limitations, but Sortsite can be used to produce a reliable overall assessment [4-5].

The evaluation was focused on three general areas:

- Errors, in which were verified: server configuration; blocked hyperlinks; page limits; user defined errors; HTTP code status; and script errors.
- Accessibility compliance regarding the Electronic and Information Technology Accessibility Standards (Section 508) [6] and the Web Content Accessibility Guidelines 2.0 (WCAG 2.0) [7].
- Usability, regarding: guidelines of legibility; guidelines according to the research in web design and usability, and to Usability.gov [8] and W3C usability guidelines [9].

The following sites, including all their pages and elements, were evaluated:

1. Teaching and learning support system (SIDE) [10-12].
2. Research scholarships management [13].
3. Pedagogical surveys.
4. Digital repository [14-16].

5. On-line certificates [17].
6. Online Campus [18].
7. Document management [19].
8. Students registry [20].
9. E-learning management system (Moodle) [21-23].
10. Intranet [24-26].

2.1 The teaching and learning support system (SIDE)

The SIDE system (at http://side.utad.pt) is the IS platform that supports the teaching and learning related processes, including most of the academic tasks and activities, performed by professors and students, at UTAD. The SIDE platform provides: courses' content publication; exams scheduling; students' attendance registration; coursework electronic submission; etc. Table 1 summarizes this item evaluation report.

A total of 756 pages were evaluated, comprising the following elements: 240 HTML pages; 237 GIF images; 7 PNG images; 4 CSS sheets; 3 Javascript scripts; 1 PDF document; 32 external links.

Table 1 – Accessibility assessment of the teaching and learning support system (SIDE).

Problems	Sortsite Classification
233 pages have quality problems.	Better than average
9 pages have errors, such as "broken links" and others.	Better than average
232 pages have accessibility problems: Priority 1 (A), 17 errors; Priority 2 (AA), 2 errors; Priority 3 (AAA), 2 errors.	Worse than average
223 pages have specific browser compatibility problems.	Worse than average
No pages with privacy problems.	Better than average
202 pages have search engines related problems.	Better than average
229 pages have compliance problems with the W3C standards.	Worse than average
231 pages have usability problems: Priority 1, 0 errors; Priority 2, 6 errors; Priority 3, 2 errors; Priority 4, 0 errors.	Better than average

2.2 Research Scholarships Management System

The Research Scholarships Management System (at www.campus.utad.pt/bolsasinvestigacao/gestao) fully supports the processes related to the UTAD's scholarships, in all

their phases, including announcements and submissions. Table 2 summarizes this item evaluation report.

A total of 53 pages were evaluated, comprising the following elements: 13 HTML pages; 15 PNG images; 23 CSS sheets; 7 scripts Javascript; 5 external links.

Table 2 - Accessibility assessment of the Research Scholarships Management System.

Problems	Sortsite Classification
29 pages have quality problems.	Worse than average
2 pages have errors, such as “broken links” and others.	Better than average
2 pages have accessibility problems: Priority 1 (A), 6 errors; Priority 2 (AA), 3 errors; Priority 3 (AAA), 2 errors.	Better than average
12 pages have specific browser compatibility problems.	Worse than average
1 page has privacy problems.	Better than average
2 pages have search engines related problems.	Better than average
9 pages have compliance problems with the W3C standards.	Better than average
13 pages have usability problems: Priority 1, 0 errors; Priority 2, 5 errors; Priority 3, 1 errors; Priority 4, 1 errors.	Better than average

2.3 Pedagogical Surveys

The Surveys System (at http://www.campus.utad.pt/questionarios/Account/Login_LDAP) is a survey tool, designed to support the processes of self-evaluation and continuous improvement of teaching and learning. It is used in all the courses, by all the students, in order to assess how the courses are being delivered. Table 3 summarizes this item evaluation report.

A total of 45 pages were evaluated, comprising the following elements: 2 HTML pages; 6 JPEG images; 9 PNG images; 6 CSS sheets; 8 Javascript scripts; 7 external links.

Table 3 - Accessibility assessment of the Pedagogical Surveys System.

Problems	Sortsite Classification
7 pages have quality problems.	Better than average
2 pages have errors, such as “broken links” and others.	Better than average
4 pages have accessibility problems:	Better than average

Priority 1 (A), 6 errors; Priority 2 (AA), 3 errors; Priority 3 (AAA), 3 errors.	
3 pages have specific browser compatibility problems.	Better than average
2 pages have privacy problems.	Better than average
3 pages have search engines related problems.	Better than average
5 pages have compliance problems with the W3C standards.	Better than average
3 pages have usability problems: Priority 1, 1 errors; Priority 2, 3 errors; Priority 3, 1 errors; Priority 4, 1 errors.	Better than average

2.4 Digital Scientific Repository

The Scientific Repository (at http://repositorio.utad.pt) is a DSPACE based system [23], built in order to store, preserve and publish the scientific and intellectual production of the university. Table 4 summarizes this item evaluation report.

A total of 14656 pages were evaluated, comprising the following elements: 6928 HTML pages; 40 GIF images; 36 PNG images; 378 JPG images; 11 CSS sheets; 29 Javascript scripts; 306 PDF documents; 3962 feeds; 2202 external links.

Table 4 - Accessibility assessment of the Digital Scientific Repository.

Problems	Sortsite Classification
71567 pages have quality problems.	Worse than average
6831 pages have errors, such as “broken links” and others.	Worse than average
7129 pages have accessibility problems: Priority 1 (A), 18 errors; Priority 2 (AA), 3 errors; Priority 3 (AAA), 5 errors.	Worse than average
81 pages have specific browser compatibility problems.	Better than average
6829 pages have privacy problems.	Worse than average
6827 pages have search engines related problems.	Worse than average
1796 pages have compliance problems with the W3C standards.	Better than average
6838 pages have usability problems: Priority 1, 1 errors; Priority 2, 3 errors; Priority 3, 1 errors; Priority 4, 1 errors.	Worse than average

2.5 On-line certificates system

The certificates system (at http://certidao.utad.pt) is a site used by the students to access their academic certificates, e.g., course registration, degree conclusion, etc. Table 5 summarizes this item evaluation report.

A total of 76 pages were evaluated, comprising the following elements: 2 HTML pages; 2 ASPX pages; 11 GIF images; 8 PNG images; 3 JPG images; 9 CSS sheets; 10 Javascript scripts; 1 PDF documents; 6 external links.

Table 5 - Accessibility assessment of the on-line certificates system.

Problems	Sortsite Classification
17 pages have quality problems.	Better than average
7 pages have errors, such as “broken links” and others.	Worse than average
11 pages have accessibility problems: Priority 1 (A), 14 errors; Priority 2 (AA), 3 errors; Priority 3 (AAA), 4 errors.	Better than average
7 pages have specific browser compatibility problems.	Better than average
No pages with privacy problems.	Better than average
7 pages have search engines related problems.	Better than average
12 pages have compliance problems with the W3C standards.	Better than average
10 pages have usability problems: Priority 1, 2 errors; Priority 2, 7 errors; Priority 3, 1 errors;	Worse than average

2.6 Campus Online site

The Campus Online site (at http://www.campus.utad.pt) is a web portal to publish academia related information to students. Table 6 summarizes this item evaluation report.

A total of 412 pages were evaluated, comprising the following elements: 97 HTML pages; 15 GIF images; 86 PNG images; 1 JPG images; 37 CSS sheets; 57 Javascript scripts; 2 PDF documents; 139 external links.

Table 6 - Accessibility assessment of the Online Campus site.

Problems	Sortsite Classification
123 pages have quality problems.	Better than average
37 pages have errors, such as “broken links” and others.	Worse than average
59 pages have accessibility problems:	Better than average

Priority 1 (A), 10 errors; Priority 2 (AA), 3 errors; Priority 3 (AAA), 4 errors.	
70 pages have specific browser compatibility problems.	Worse than average
No pages with privacy problems.	Better than average
47 pages have search engines related problems.	Better than average
58 pages have compliance problems with the W3C standards.	Better than average
99 pages have usability problems: Priority 1, 0 errors; Priority 2, 5 errors; Priority 3, 3 errors; Priority 4, 0 errors;	Worse than average

2.7 GESDOC document management system

The GESDOC (at http://gesdoc.utad.pt) is a process workflow system that electronically supports some of the organization wide administrative process. Table 7 summarizes this item evaluation report.

A total of 43 pages were evaluated, comprising the following elements: 2 HTML pages; 1 ASPX page; 5 PNG images; 5 JPG images; 5 CSS sheets; 5 Javascript scripts; 9 PDF documents; 6 external links.

Table 7 - Accessibility assessment of the document management system.

Problems	Sortsite Classification
17 pages have quality problems.	Better than average
3 pages have errors, such as “broken links” and others.	Worse than average
13 pages have accessibility problems: Priority 1 (A), 11 errors; Priority 2 (AA), 3 errors; Priority 3 (AAA), 3 errors.	Worse than average
4 pages have specific browser compatibility problems.	Better than average
1 page has privacy problems.	Better than average
2 pages have search engines related problems.	Better than average
4 pages have compliance problems with the W3C standards.	Better than average
5 pages have usability problems: Priority 1, 0 errors; Priority 2, 5 errors; Priority 3, 1 errors; Priority 4, 1 errors;	Better than average

2.8 Students registry

The students registry (at http://www.campus.utad.pt/registoacademico) is a web application that provides the interface features to access the full records of the students, including, course plans, fees, grades, and other additional documents. Table 8 summarizes this item evaluation report.

A total of 425 pages were evaluated, comprising the following elements: 99 HTML pages; 15 GIF images; 89 PNG images; 1 JPG image; 40 CSS sheets; 59 Javascript scripts; 2 PDF documents; 142 external links.

Table 8 - Accessibility assessment of the Students Registry System.

Problems	Sortsite Classification
128 pages have quality problems.	Better than average
37 pages have errors, such as "broken links" and others.	Worse than average
62 pages have accessibility problems: Priority 1 (A), 10 errors; Priority 2 (AA), 3 errors; Priority 3 (AAA), 4 errors.	Better than average
72 pages have specific browser compatibility problems.	Worse than average
No page has privacy problems.	Better than average
49 pages have search engines related problems.	Better than average
60 pages have compliance problems with the W3C standards.	Better than average
102 pages have usability problems: Priority 1, 0 errors; Priority 2, 6 errors; Priority 3, 4 errors; Priority 4, 0 errors;	Better than average

2.9 E-learning management system (Moodle)

The e-learning management system (at http://moodle.utad.pt) is a Moodle based platform [24], used, together with SIDE, to support the leaning and teaching activities. Table 9 summarizes this item evaluation report.

A total of 855 pages were evaluated, comprising the following elements: 56 HTML pages; 708 PHP pages; 15 PNG images; 1 JPG image; 10 CSS sheets; 23 Javascript scripts; 21 external links.

Table 9 - Accessibility assessment of the e-learning management system.

Problems	Sortsite Classification

772 pages have quality problems.	Worse than average
488 pages have errors, such as “broken links” and others.	Worse than average
712 pages have accessibility problems: Priority 1 (A), 6 errors; Priority 2 (AA), 5 errors; Priority 3 (AAA), 3 errors.	Worse than average
765 pages have specific browser compatibility problems.	Worse than average
No page has privacy problems.	Better than average
243 pages have search engines related problems.	Worse than average
184 pages have compliance problems with the W3C standards.	Better than average
76 pages have usability problems: Priority 1, 0 errors; Priority 2, 4 errors; Priority 3, 4 errors; Priority 4, 0 errors;	Worse than average

2.10 Intranet portal

The intranet portal (at http://www.intra.utad.pt) is the university’s internal platform to store and share information and worflows, based on Microsoft Sharepoint [25]. Table 10 summarizes this item evaluation report.

A total of 6035 pages were evaluated, comprising the following elements: 49 HTML pages; 4144 ASPX pages; 55 GIF images; 74 PNG images; 19 JPG image; 19 CSS sheets; 15 Javascript scripts; 25 external links.

Table 10 - Accessibility assessment of the intranet portal.

Problems	Sortsite Classification
6035 pages have quality problems.	Worse than average
2028 pages have errors, such as “broken links” and others.	Worse than average
3952 pages have accessibility problems: Priority 1 (A), 29 errors; Priority 2 (AA), 5 errors; Priority 3 (AAA), 2 errors.	Worse than average
2093 pages have specific browser compatibility problems.	Worse than average
1 page has privacy problems.	Better than average
2089 pages have search engines related problems.	Worse than average
2089 pages have compliance problems with the W3C standards.	Worse than average
4101 pages have usability problems: Priority 1, 1 errors;	Worse than average

Priority 2, 7 errors; Priority 3, 6 errors; Priority 4, 1 errors; Priority 5, 1 errors;

3 Conclusion

The sites collection is heterogeneous, in regard to their size, usage, content, and life time. So, as expected, there are very different evaluation results, from which several conclusions can be drawn.

The sites with the poorest performance are those in which the user (or user community) can create content. The intranet portal or the elearning portal are good examples, on which the users can create content, sometimes with a short life span, e.g., an event or an academic year. Soon after the content creation, the pages will not be maintained, thus resulting in broken links, future browser compatibility issues, etc. As the sites get older, without proper content maintenance, this problem will grow critical.

The sites designed as web application for specific purposes, in which the content form and the user interface are predetermined in the development phase, have generally good performance. Two examples are the Students registry and Gesdoc, in which the content is retrieved from databases and later rendered by the system, prior to being delivered to the user. Is this cases, the accessibly issues are well tackled by the software designers and programmers.

The three sites requiring urgent attention are: repository, elearning, and intranet. In this cases, the platforms supporting the sites (DSpace, Moodle, and SharePoint) are widely used for their specific purposes and have the necessary accessibility features built in. It is up to the integrator or final user to have the correct content creation practices in order to incorporate the accessibility features.

In terms of future actions, four proposals, based on this conclusions:

1. To implement a continuous monitoring of the sites accessibility (a periodically assessment should be scheduled) with a periodic report regarding the accessibility compliance of each content creator.
2. To edit a content creation guideline, including an accessibility compliance section.
3. To implement a content maintenance schedule or program in order to remove out-of-date content.
4. To develop further accessibility compliance actions, including manually assessments, focused on specific content and use cases.

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