

An Evaluation of the Usability of IT Faculty Educational Portal at University of Benghazi

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Abstract—Evaluation of educational portals is an important subject area that needs more attention from researchers. A university that has an educational portal which is difficult to use and interact by teachers or students or management staff can reduce the position and reputation of the university. Therefore, it is important to have the ability to make an evaluation of the quality of e-services the university provide to improve them over time.

The present study evaluates the usability of the Information Technology Faculty portal at University of Benghazi. Two evaluation methods were used: a questionnaire-based method and an online automated tool-based method. The first method was used to measure the portal's external attributes of usability (*Information, Content and Organization of the portal, Navigation, Links and Accessibility, Aesthetic and Visual Appeal, Performance and Effectiveness and educational purpose*) from users' perspectives, while the second method was used to measure the portal's internal attributes of usability (*number and size of HTML files, number and size of images, load time, HTML check errors, browsers compatibility problems, number of bad and broken links*), which cannot be perceived by the users. The study showed that some of the usability aspects have been found at the acceptable level of performance and quality, and some others have been found otherwise. In general, it was concluded that the usability of IT faculty educational portal generally acceptable. Recommendations and suggestions to improve the weakness and quality of the portal usability are presented in this study.

Keywords—Automated tools-based evaluation, Educational portals, Evaluation criteria, Questionnaire-based evaluation, Usability evaluation.

I. INTRODUCTION

SINCE the first electronic web service introduced in the last century, electronic services have spread across the globe in various shapes, changing the face and way of many businesses and organizations. This new e-revolution has reduced the digital divide and transforming societies into knowledge-based societies all over the world [1]. In present, the Internet is a very large repository of contents in different formats and shapes (text, video or audio clips, graphic, etc). These contents are spread on the web in many resources as sites, repositories, online databases, encyclopedias and portals [2].

At the educational level, a huge variety of educational portals are found on the Web. Some of them are general and others more specific. In fact, educational portal should be

more than just a repository site. It must be able to provide a collaborative environment for the development, evaluation and sharing of materials and educational resources, which lead to the question of the quality of content of the technical features available in the system [2].

Evaluation of educational websites and/or educational portals is a subject area that has not received a significant amount of published research. There are many general websites that introduce basic standards and criteria for evaluating Internet content and information, however, researchers in this field believe that educational websites and/or educational portals need to consider a specific set of criteria for evaluating its content and information [3].

A university that has an educational website which is difficult to use and interact by teachers or students or management staff can reduce the position and reputation of the university. The need to assess the quality and reliability of educational sites led to the emergency of studies focusing specifically on the analysis and evaluation of educational portals. Therefore, it is important to have the ability to make an evaluation of the quality of e-services the university provide to improve them over time. The present study attempts to analyze and evaluate the educational portal of IT faculty at university of Benghazi for the purpose of giving suggestions and recommendations for improvements.

Vultur and Marincas [4] presented a Web Assessment Index (WAI) for evaluating academic websites. The index contained five categories: Accessibility, Access Speed, Navigability, Content and Reliability. It was applied to evaluate five websites of Economics Romania Faculties. The results of the study showed that the average WAI for evaluated websites was 64.6%, which means that they have partly met the objectives of their educational plans, and they need improvements of their websites. It was concluded that there are more aspects on websites than web design, which most firms focused on. These aspects were discussed and debated in this study.

A study about the effectiveness of automated website evaluation tools has been conducted by Ivory and Chevalier [5]. They described current practices for constructing usable and accessible sites. Findings from experienced designers' usage of three automated evaluation tools (WatchFire Bobby, W3C HTML Validator, and UsableNet LIFT) to improve sites, and findings from users' usage of the original and modified sites were presented in this study.

Olsina et al [6] proposed a quantitative evaluation approach to assess the quality of sites, which called Website Quality

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Evaluation Method (QEM). The approach aimed to evaluate the level of accomplishment of required quality characteristics (usability, functionality, reliability, efficiency, and derived sub-characteristics) in six academic sites. At the end of the evaluation process, a ranking for each selected site is obtained. The state-of-the-art of the quality in the operation phase of these sites, as well as some concluding remarks were presented.

Lencastre and Chaves [7] introduced a study about usability evaluation of an educational website for the subject of image study in education, which designed to be used in a Master's degree in the Universidade do Minho, Portugal. The study was focused on the relevant literature and the application of a questionnaire about the usability of the site «www.atelierdaimagem.org». An analysis of data and concluding remarks were presented.

A study on usability evaluation of some selected university websites in Bangladesh has been presented by [1]. Two online automated tools (HTML Toolbox and Web Page Analyzer) were used together with a questionnaire directed to users of these websites. Tools were used to measure the websites' internal attributes which cannot be measured by the users such as html code errors, download time, and size of the html pages. The questionnaire was used to measure user satisfaction of five categories of usability aspect. The study showed that users, in general, are not satisfied on usability level of these websites. However, there are some weaknesses in some aspects of the design, interface, and performances. Internal features of the websites were also measured and suggestions were provided in the study to enhance the usability of these websites.

The main objective of this study is to evaluate the usability of educational portal of Information Technology Faculty at University of Benghazi, and find out the weakness of this portal and give suggestions for improving its quality and usability. In order to achieve this objective, the following specific tasks have to be accomplished:

- (1) Identify criteria for the usability evaluation of educational portal.
- (2) Investigate the usability of IT faculty educational portal with the identified criteria using questionnaire technique. This kind of evaluation method intended to focus on assessing the usability of the IT faculty educational portal from the user's perspective. Only external attributes of the portal (such as readability of the contents and information of the portal, navigation and accessibility, visual appeal, and educational purpose) can be assessed.
- (3) Investigate the internal attributes of the IT faculty educational portal (such as number of broken and bad links, browsers compatibility problems, download time, images number and size) using online automated tools.

II. OVERVIEW OF IT FACULTY EDUCATIONAL PORTAL AT UNIVERSITY OF BENGHAZI

The educational portal of IT faculty is a Web-based electronic system aimed to automate the work and provide educational services at the Faculty of Information Technology

at University of Benghazi. It is considered the first electronic system running in the Libyan higher educational institutions. Since its working in January 2008, the portal saved a lot of time, effort and work of many staff at the faculty, and helped to obtain statistics and indicators at anytime from anywhere. It contains a smart electronic registration system that stores the information about regulations and relevant registration procedures where the electronic advisor deals with the student in the process of enrollment according to these regulations. This was helpful in reducing the crowd of students during the period of registration. Figs. 1 and 2 below show an overview of the portal [8].



Fig. 1 Portal's opening window [8]



Fig. 2 Portal's teaching staff window [8]

Many users can benefit from this portal; faculty dean, academic head department, management and teaching staff and students. These benefits can be summarized as following:

- **For students:**
 - ✓ Accessing the portal anytime from anywhere.
 - ✓ Registering courses for new semester with the help from e-advisor.
 - ✓ Viewing and printing out courses and exams timetables, midterm exam results for current semester courses and student's transcript for past semesters.
 - ✓ Viewing announcements issued by faculty management.

- ✓ Exchanging (sending and receiving) messages with portal administration, teaching staff, students, academic departments.
- ✓ Downloading course's academic material, lecture notes, course assignments and exercises.
- ✓ Other related services
- **For teaching staff:**
- ✓ Viewing and printing out courses and examinations timetables, list of students registered in the course.
- ✓ Sending midterm exam results and assignment results to students.
- ✓ Sending messages to particular student or group of students.
- ✓ Uploading course's academic material, lecture notes assignments and exercises.
- **For faculty management staff:**
- ✓ Entering data for students, teaching staff, courses taught, rooms, courses and exams timetables, etc).
- ✓ Sending announcements for students or group of students.
- ✓ Responding to incoming messages from students and teaching staff.
- ✓ Controlling and monitoring students registration process and providing help and advice whenever needed.
- ✓ Uploading final year student's projects and scientific materials.
- **For faculty dean and academic head department:**
- ✓ Getting information about students, teaching staff, academic departments, registration process, etc.
- ✓ Uploading announcements and resolutions related to dean office.
- ✓ Communicate with students, teaching staff and management staff.
- ✓ Controlling and monitoring all activities done at the portal.
- ✓ Supervising electronic library (e-books, final projects, scientific and research papers, lecture notes and course material, etc).

III. METHODOLOGY OF THE STUDY

A. Introduction

In this study, two website/portal evaluation methods were carried out: the questionnaire-based method and automated tools-based method, in order to evaluate the usability of IT faculty educational portal at University of Benghazi. The first method was intended to focus on how the usability of IT faculty educational portal can be evaluated from the user's perspective. Only external attributes of the portal (such as readability of the contents of the portal) can be assessed by this method. The second method was intended to focus on how to measure the internal attributes of the portal, which cannot be assessed by human. A description of the implementation of these methods is shown in the following sections.

B. Questionnaire-Based Evaluation Method

The questionnaire used in this part of the evaluation was divided into two sections. The first section contained the

characteristics of participants, such as: academic department, gender and age of participant, participant's semesters, internet and computer experience, and participant's access frequency of the portal. The second section contained thirty six questions that were used to evaluate the usability of academic websites and/or portals. These questions were classified into five categories. They were selected and prepared after a study of some related resources [1], [3], [4], [9].

- CAT-1: Information, Content and Organization
- CAT-2: Navigation, Links and Accessibility
- CAT-3: Aesthetic and Visual Appeal
- CAT-4: Performance and Effectiveness
- CAT-5: Educational Purpose

Questions under each category given above were assessed on a scale of five items as shown in Table I. The response to each question is assigned an assessment value. The values are then accumulated according to the five usability categories shown above. Mean value for each category is considered as the usability index for that category (out of 5 points). The overall portal usability index is the mean value of usability points for the five categories.

TABLE I
QUESTIONS ASSESSMENT SCALE

Assessment Option	Assessment Point (Value)
Strongly Disagree (SD)	1
Disagree (D)	2
Undecided (UnD)	3
Agree (A)	4
Strongly Agree (SA)	5

The usability level and percentage of each category is determined by the usability points. Table II shows the usability points and the corresponding usability level and percentage.

TABLE II
USABILITY LEVEL AND PERCENTAGE SCALE

Points (PT)	Usability Level	Usability Percentage (UP)
$PT \leq 2$	Poor	$UP \leq 40$
$2 < PT \leq 3$	Moderate	$40 < UP \leq 60$
$3 < PT \leq 4$	Good	$60 < UP \leq 80$
$4 < PT \leq 5$	Excellent	$80 < UP \leq 100$

C. Automated Tools-Based Evaluation Method

An automated evaluation tool, namely HTML Toolbox, was used to assess the internal attributes (factors) of portal usability. It is available from NetMechanic Inc [10]. This tool can help by measuring and identifying some of the internal attributes of a website and/or portal. Since websites and portals are dynamic in nature, factors mentioned below were measured and analyzed on specific date and time. Changes/updates and new pages that appeared after the date of analysis were not included in the study. The internal attributes that were measured using this tool include:

- Total # of HTML Files
- Total HTML Page Size (KB)
- Total # of Images
- Total Size of Images (KB)
- Load Time (56Kbps)

- HTML Check Errors
- Browsers Compatibility Problems
- Total # of Links Tested
- Total # of Bad Links

IV. RESULTS AND DISCUSSIONS

A. For Questionnaires-Based Evaluation Method

The questionnaire prepared in this study was applied at the Information Technology Faculty of Benghazi University during the period between 15-28 May 2012. A total of 398 students from different academic departments have been participated in this study. They were selected randomly through face-to-face contact and given an explanation to the purpose of the study. Furthermore, to encourage participants to give their best opinion, it was clarified that their responses would be completely confidential and would only be used for the purposes of this study and not given to anybody else.

The sample of participants was 56% females and 44% males. Ages of most participants ranges between 18-23 yrs (87.5%), while others (12.5%) were greater than 24 yrs. Students of first semester were not intended in this study as they would not start use the portal regularly and issued username and password until the second semester. 62.6% of participants are in semester level ranges between 5-12, where most of them had been assigned to one of academic departments. The rest of participants (37.4%) are in semester level ranges from 2-4, where most of them studying general education and information technology courses (General IT Department). As of computer and internet experience, significant number of participants had computer and internet experience for more than 4 years. 56% of participants had 4 years or more computer experience and 42% of them had 4 years or more internet experience. Only 5% of participants had less than 1 year experience with computer and 11% of them had less than 1 year experience with internet. In terms of portal frequency of use, most of participants (63%) use the portal between 1-3 times per week and only 11% use it daily. Other (26%) use the portal only at the beginning of the semester for the purpose of registration process.

Figs. 3-8 below show graphical illustrations to the statistics described above.

Study Sample Gender Distribution

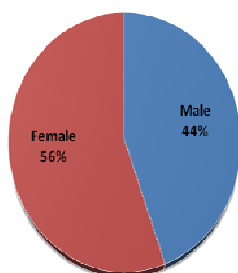


Fig. 3 Study sample grouped by Gender

Study Sample Age Distribution

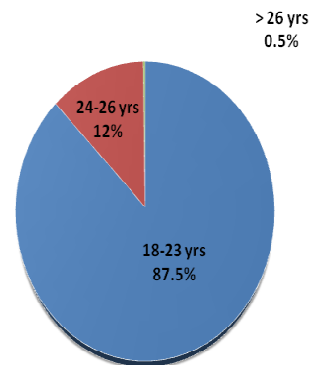


Fig. 4 Study sample grouped by Age

Study Sample Semester Level Distribution

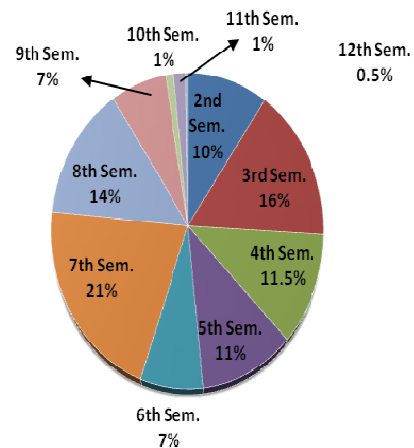


Fig. 5 Study sample grouped by Semester Level

Study Sample Computer Experience Distribution

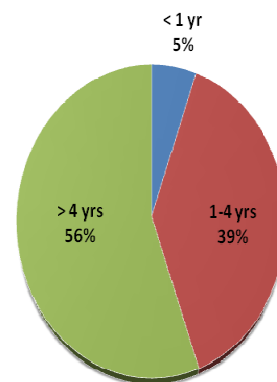


Fig. 6 Study sample grouped by Computer Experience

Study Sample Internet Experience Distribution

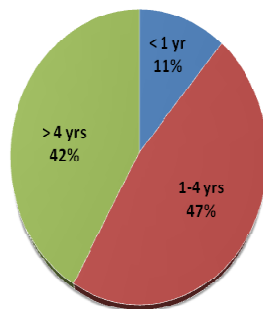


Fig. 7 Study sample grouped by Internet Experience

Study Sample Frequency of Use Distribution

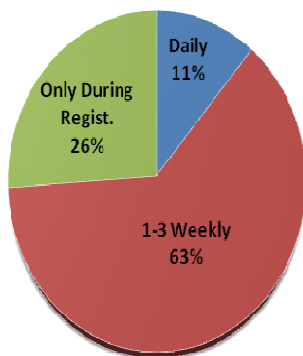


Fig. 8 Study sample grouped by Frequency of Use

The results obtained from the questionnaire-based evaluation method are presented and discussed in subsequent paragraphs. Table III presents a summary of assessment options distribution, in percentages, for each category and Fig. 9 shows the graphical representation to the results of assessment options, in numbers, for each category. As seen in Table III, 45.2% out of the total number of participants were satisfied with the usability level of the portal, while 30.5% of participants were not satisfied and 24.3% were undecided whether they are satisfied or not satisfied with the usability of the portal.

TABLE III
RESULTS OF THE QUESTIONNAIRE (%)

Category	Assessment Options				
	(1) SD	(2) D	(3) UnD	(4) A	(5) SA
Information, Content and Organization	9.2	17.4	25.8	39.9	7.7
Navigation, Links and Accessibility	7.9	15.5	31.1	37.2	8.3
Aesthetic and Visual Appeal	9.3	14.0	15.4	46.5	14.7
Performance and Effectiveness	15.9	20.0	24.4	31.2	8.5
Educational Purpose	20.0	20.4	22.9	29.1	7.6
Overall	12.8	17.7	24.3	36.1	9.2

Frequency of Assessment Options for Each Category

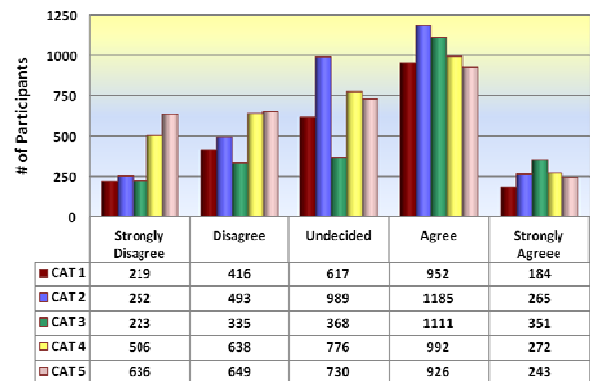


Fig. 9 Distribution of assessment options for each category

It can also be noted that in Table IV, the usability category *Aesthetic and Visual Appeal* (CAT-3) obtained the highest evaluation value, followed by the category *Navigation, Links and Accessibility* (CAT-2) and then category *Information, Content and Organization* (CAT-1), which all of them were being rated as "Good" according to the scale used. The other two categories: *Performance and Effectiveness* (CAT-4) and *Educational Purpose* (CAT-5) were being rated "Moderate". The overall usability level for the portal of Information Technology Faculty at University of Benghazi has been evaluated by participants as "Good", which represents 61.8% as per the usability scale used in this study. Fig. 10 shows the evaluation results for each category in different kind of representation.

TABLE IV
ASSESSMENT RESULTS FOR EACH CATEGORY

Category	Usability Point	Usability %	Usability Level
Information, Content and Organization	3.2	63.1	Good
Navigation, Links and Accessibility	3.2	63.9	Good
Aesthetic and Visual Appeal	3.4	68.0	Good
Performance and Effectiveness	2.9	58.3	Moderate
Educational Purpose	2.8	55.7	Moderate
Overall	3.1	61.8	Good

Assessment Results for Each Category

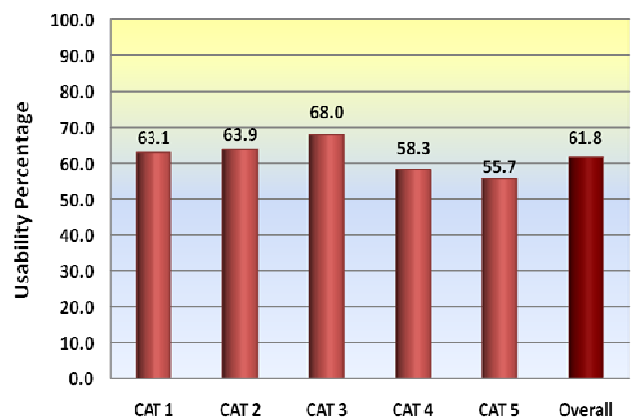


Fig. 10 Assessment results for each category

Evaluation results have also been grouped by categories and departments, as shown in Fig. 11. It can be seen that the participants of IS department were demonstrated the highest satisfaction, 65.8% (Good), with the usability level of the portal, followed by CS department with 63.7% (Good) and then general IT department with 63.4%, followed by SE department with 60.6% (Good). Whereas, the participants of other two departments, CE and CN, demonstrated the lowest satisfaction with the usability level of the portal with 59.5% (Moderate) and 57.8% (Moderate) respectively.

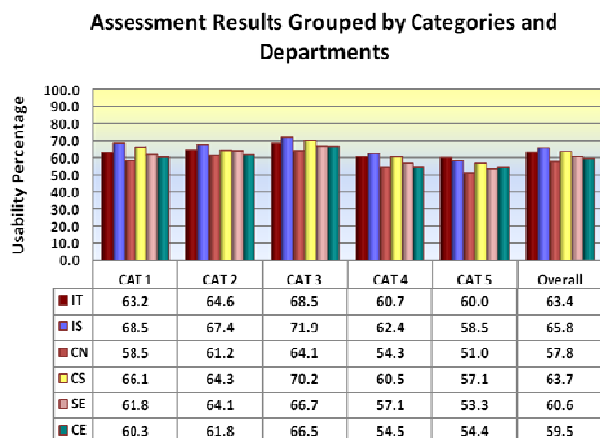


Fig. 11 Assessment results grouped by categories and academic departments

B. For Automated Tools-Based Evaluation Method

In order to be able to evaluate the portal using automated online tools, URL for portal pages has to be available. For this purpose, an entire portal was downloaded using A1 Website Download 4.0.4 free trial software available from Microsys company [11]. In total, 38 portal's pages were obtained using this downloading software. HTML Toolbox was used to assess internal attributes of portal usability that described early. The portal download and the use of HTML Toolbox for evaluation were carried out on 28, 29 and 30 of May 2012. Changes/updates and new pages that appeared after the date of analysis were not included in the study. The average results obtained from this automated evaluation tool are presented in Table V. Description for each of the results presented in Table V is given below.

TABLE V
AVERAGE RESULTS OBTAINED FROM HTML TOOL

No.	Factors to be Measured	Average Value
1	# of HTML Files	1
2	HTML Page Size (KB)	24.12
3	# of Images	16.82
4	Size of Images (KB)	93.31
5	Load Time (56Kbps)	18.96 (second)
6	HTML Check Errors	5.76 (errors)
7	Browsers Compatibility Problems	12.29 (problems)
8	# of Links Tested	40.08
9	# of Bad Links	1.08

- **# of HTML Files:** The average number of HTML files for the portal pages is 1, which is an appropriate value, where the recommended value is 2.
- **HTML Page Size:** The average portal page size is 24.12 KB, which will load in 18.96 seconds on a 56Kbps modem. This value is appropriate, where the recommended value is 100 KB.
- **# of Images:** The average number of images is 16.82, which is a moderate amount of images, where the recommended value is 12.
- **Size of Images:** The average image size is 93.31 KB, which is over the acceptable limit, where the recommended value is 50 K.
- **Load Time:** Page load time depends on several factors such as: the size of the HTML file, the number and size of the images, the number of servers that must be contacted to download files and images, and the speed of the user's modem. The average download time for the portal is 18.96 seconds on a 56Kbps modem, which is over the acceptable limit (15 seconds). This might be due to the large number and size of images the portal contains.
- **HTML Check Errors:** The average HTML code errors is 5.76. These problems may cause the page to display incorrectly under different browsers, which affect the portal users.
- **Browsers Compatibility Problems:** The tool used shows how well the portal's pages are displayed by different browsers. In average, 12.29 compatibility problems were found in the studied portal. These problems affect the portal users.
- **# of Links Tested and Bad Links:** The average number of links tested in the portal is 40.08 per page. Out of these links 1.08 link found to be bad or not working correctly. This problem affects the portal users.

V.CONCLUSION AND RECOMMENDATIONS

A. Conclusion

In this study, two website evaluation approaches: the questionnaire-based approach and automated tools-based approach were conducted to evaluate the usability of IT faculty educational portal at University of Benghazi. The first approach used to measure the external usability attributes of IT faculty educational portal (Information, Content and Organization of the portal, Navigation, Links and Accessibility, Aesthetic and Visual Appeal, Performance and Effectiveness and educational purpose) from the user's point of view. The second approach used to measure the internal usability attributes of the portal (number and size of HTML files, number and size of images, load time, HTML check errors, browsers compatibility problems, number of bad and broken links), which cannot be assessed by human. The results obtained from both approaches showed that the usability of IT faculty educational portal generally acceptable. The study showed that some of the usability aspects have been found at the acceptable level of performance and quality (met the users expectations), and some others have been found otherwise (not

met the users expectations).

B. Recommendations

To overcome the weakness and improve the quality of the portal usability that have been found in this study, suggestions and recommendations are given below in this regard:

- More attention and priority should be given for improving portal's interface design in general.
- Providing more links and examples to the users to get the desired information.
- Providing more useful messages to clarify users how to proceed when facing problems while browsing.
- Contact person/party should be clearly stated to facilitate users contact about anything in the portal.
- More attention should be give to update personnel and course information regularly, in order to keep portal's information up-to-date.
- Providing information about instructors' office location and hours, and e-mail addresses to allow students interact and contact easily with their instructors.
- More attention must be paid to calculations done at the portal, in order to be free of errors and avoiding any problems during registration process.
- Providing the portal with more scientific material (books, papers, projects and reports, presentations, etc).
- Reduce the number of servers connected to the portal (if any) and reduce some of the images that occupy large sizes on the portal, in order to reach the recommended value of load time.
- The average number and size of images on the portal exceed the appropriate values and need to be reduced to the acceptable and reasonable values. It is recommended to combining, replacing, and optimizing graphics, considering different graphic formats to achieve smaller file sizes (from JPEG to PNG for example).
- Changing the top-level-domain of the portal URL from ".org" to ".edu", in order to reflect accurately its content type.

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