Evaluation of usability, navigability, and accessibility regarding the interface design for the digital repository for educational podcasts - a user view

Avaliação da usabilidade, navegabilidade e acessibilidade do design da interface do repositório digital de podcasts educacionais - uma visão do usuário

DOI: 10.55905/revconv.16n.12-278

Recebimento dos originais: 17/11/2023
Aceitação para publicação: 21/12/2023

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ABSTRACT
To evaluate the interface of the Digital Repository for Educational Podcasts. The objective is to verify the main usability, navigability, and accessibility requirements used during the implementation, as well as contemplate the interaction level on the part of the users when using the system and verify its influence in accessing information. This article is supported by an exploratory qualitative approach with the purpose of detecting the level of usability, navigability, and accessibility measured during the use of the system. Data collection was carried out with the aid of a survey-type form available at address <https://forms.gle/xuDEq6RR46R4npVP8> and based on some parameters contained in the Reeves Method used for educational software assessment, with the aim of identifying the acceptance of the interface by its audience. The research was applied to a class of the Special Undergraduate Program for Training Professors for Professional Education (PEG). The results obtained helped identify the requirements not adopted, as well as suggestions of possible future corrections; upon completing the analysis, it was possible to identify the difficulty on the part of the respondents in finding problems and, consequently, suggesting corrections related to the criteria analyzed. Through the evaluation of the Repository interface, it was possible to contemplate that it meets the main usability, navigability, and accessibility requirements, presenting a low error rate and few problems.
RESUMO
Avaliar a interface do Repositório Digital de Podcasts Educacionais. O objetivo é verificar os principais requisitos de usabilidade, navegabilidade e acessibilidade utilizados durante a implementação, bem como contemplar o nível de interação por parte dos usuários na utilização do sistema e verificar sua influência no acesso às informações. Este artigo está apoiado em uma abordagem qualitativa exploratória com o objetivo de detectar o nível de usabilidade, navegabilidade e acessibilidade medido durante o uso do sistema. A coleta de dados foi realizada com o auxílio de um formulário do tipo survey disponível no endereço <https://forms.gle/xuDEq6RR46R4npVP8> e com base em alguns parâmetros contidos no Método Reeves, utilizado para avaliação de softwares educacionais, com o objetivo de identificar a aceitação da interface pelo seu público. A pesquisa foi aplicada em uma turma do Programa Especial de Graduação para Formação de Professores para a Educação Profissional (PEG). Os resultados obtidos ajudaram a identificar os requisitos não adotados, bem como sugestões de possíveis correções futuras; ao concluir a análise, foi possível identificar a dificuldade dos respondentes em encontrar problemas e, consequentemente, sugerir correções relacionadas aos critérios analisados. Por meio da avaliação da interface do Repositório, foi possível contemplar que ela atende aos principais requisitos de usabilidade, navegabilidade e acessibilidade, apresentando uma baixa taxa de erros e poucos problemas.

Palavras-chave: repositórios digitais para podcasts educacionais, acessibilidade, usabilidade, navegabilidade.

1 INTRODUCTION
The Digital Repository for Educational Podcasts is an information system composed of digital files in audio format that was developed from their users with the purpose of obtaining, organizing, disseminating, and preserving the production of educational podcasts. These systems may be considered a type of digital library, and, in the current situation we live in due to the COVID-19 Pandemic, act as important channels to mediate research, classes, and clarify doubts, all responding to the worldwide open access movement. Therefore, it is necessary to broaden the knowledge regarding the needs and expectations of the users of such repositories as per the accessibility, usability, and navigability made available by the tool.

The Digital Repository for educational podcasts will serve various users, including students, professors, and the community in general. In this research, we studied Usability, Navigability, and Accessibility from the perspective of the final user. It is understood that the respondents are mostly students in training who are used to using an information system,
constituting an interesting group for collecting data given that it is possible to observe the speed and ease to learn to use the interface.

The overall objective of this article is to describe the interaction among users of the Digital Repository for Educational Podcasts. To achieve the overall objective, two specific objectives were determined: Characterize the repository interface according to accessibility, navigability, and usability parameters; Identify the possible difficulties in using the interface of the Repository in the process of recovering information contained therein, as well as receive feedback containing suggestions for the possible upgrading of the platform, given that it was developed using the Design-Based Research (DBR) methodology, which enables developing the assessment of the results and, consequently, performing the refining of the system.

2 METHODOLOGY

To achieve the proposed objectives, an exploratory qualitative approach was developed. The user profile identification and the assessment of the usability, navigability, and accessibility of the repository interface were carried out from the application of a survey-type form to eight students from a class of the Program for training professors for professional education (PEG) of the Federal University of Santa Maria; the questions that compose the interview form were based on the Reeves software evaluation method, which presents two complementary approaches to the assessment of educational software. One of them is based on fourteen criteria related to the user interface, and the other on ten criteria. The results according to the specific objectives of the evaluation are presented next.

3 DEVELOPMENT

3.1 HUMAN-COMPUTER INTERACTION (HCI)

Human-Computer Interaction, or HCI, refers to the area that concerns the relationship between humans and computers. Hiratsuka (1996) defines human-computer interaction as the study of interdisciplinary and multidisciplinary nature that aims the design and adaptation of computational systems to their users, helping people to perform their tasks and promoting more considerable satisfaction, safety, and productivity. HCI has an important role in the design and development of all types of computerized systems. Given the importance of HCI in developing an interface, the Interaction criteria were employed during the creation and development of the
digital repository for educational podcasts. To Norman (2003), it is not enough to design software that merely works or has the functionalities required for fulfilling the task. It is not acceptable to make it the sole responsibility of the user to learn to use a complex system.

The development of the Design for the interface of the Digital Repository for Educational Podcasts was underpinned by the criteria listed by Norman (2003), as shown in the chart below:

<table>
<thead>
<tr>
<th>Criteria Listed by Norman (2003)</th>
<th>Description</th>
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<tbody>
<tr>
<td>Good control flow:</td>
<td>Direct and efficient interaction flow, from the start of an activity until</td>
</tr>
<tr>
<td></td>
<td>the end.</td>
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<tr>
<td>Clear navigation:</td>
<td>Well-identified menu options. Distinct icons with caption texts.</td>
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<td>Use of direct manipulation:</td>
<td>Allow the user direct control.</td>
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<td>Good screen layouts (designs):</td>
<td>Consistent positioning of the objects on the screen.</td>
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<tr>
<td>Good feedback (return of data to the user):</td>
<td>The system keeps the user informed of its progress or state.</td>
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<td>Error manipulation:</td>
<td>Well-written error messages in a positive tone and providing clear</td>
</tr>
<tr>
<td></td>
<td>instructions.</td>
</tr>
<tr>
<td>Effective use of graphics, colors, and audio:</td>
<td>Use of these elements in a sophisticated manner, with good quality and</td>
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<tr>
<td></td>
<td>contrast between figure and background.</td>
</tr>
<tr>
<td>Appropriate complexity:</td>
<td>The software is sufficiently complex to perform the required task but</td>
</tr>
<tr>
<td></td>
<td>not complex enough to confuse the user.</td>
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<tr>
<td>Ability to present multimedia:</td>
<td>The software must be fast enough to load graphics, play sounds, and display</td>
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<td></td>
<td>animations or films without annoying pauses.</td>
</tr>
<tr>
<td>Good degree of reliability:</td>
<td>Free of software errors (bugs) or system failures and interruptions.</td>
</tr>
<tr>
<td>Maintenance, change to new versions (upgrade), and expansion:</td>
<td>The system must have easy maintenance, good support, and upgrade capability</td>
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<td>relative to new hardware and operating systems.</td>
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</tbody>
</table>

Source: Author

3.2 INTERFACE DESIGN

The User Interface (UI) consists of everything the user comes into contact with during the interaction with the system. In graphic interfaces, users communicate with the systems through that which they can see. The physical design has the role of mediating the interaction of people with computational systems. The interface design has the task of creating the mediation between system and user and enables:
Table 2: User Interface (UI)

<p>| | |</p>
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<tbody>
<tr>
<td>1)</td>
<td>Highlighting the main activity of the application and guaranteeing the subsidies necessary for the user to complete any task.</td>
</tr>
<tr>
<td>2)</td>
<td>Investing the greatest efforts on the application factors that are more important from the user's viewpoint.</td>
</tr>
<tr>
<td>3)</td>
<td>Thinking of the interface design as an activity to be filled out from top to bottom.</td>
</tr>
<tr>
<td>4)</td>
<td>Making a logical path available to the user.</td>
</tr>
<tr>
<td>5)</td>
<td>Rendering the interaction easy and obvious.</td>
</tr>
<tr>
<td>6)</td>
<td>Facilitating data input.</td>
</tr>
<tr>
<td>7)</td>
<td>Stimulating connectivity and collaborative behavior.</td>
</tr>
<tr>
<td>8)</td>
<td>Making the interface as realistic as possible.</td>
</tr>
<tr>
<td>9)</td>
<td>Giving support to the change in orientation.</td>
</tr>
<tr>
<td>10)</td>
<td>Keeping the user aware of any action.</td>
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<tr>
<td>11)</td>
<td>Giving control to the user.</td>
</tr>
<tr>
<td>12)</td>
<td>Creating a help page.</td>
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<tr>
<td>13)</td>
<td>Betting on a minimalist design.</td>
</tr>
<tr>
<td>14)</td>
<td>Using professionally-edited high-definition images and graphics.</td>
</tr>
<tr>
<td>15)</td>
<td>It enables using components as appropriate.</td>
</tr>
</tbody>
</table>

Source: Author

However, for evaluating the interface and the use of the requirements mentioned, there is a technique denominated a heuristic elaborated as a subsidy to assess the usability of an interface that is already designed or ready. Nielsen (1993), a renowned researcher in usability engineering and usability assessment, defines usability as one of the components that integrate the acceptability of a system. Usability is related to how well the users can use the functionalities of a system and may be decomposed into five attributes: ease of learning, use efficiency, ease of remembering, few errors, and the subjective satisfaction of the user.

3.3 THE REEVES METHOD FOR USABILITY ASSESSMENT

Rezende (1998) Reeves developed the software assessment method with two approaches used by several works related to the software assessment issue. The first approach aims to evaluate the pedagogical aspects, while the other aims to assess the aspect regarding human-computer interaction and usability. Their application consists of a heuristic assessment using charts with a scale in two directions, as one may observe in the example below:
3.4 EVALUATE THE NAVIGABILITY

Navigability is precisely the ease that the user has in accessing your tool's pages.

To Burgos (2006), navigating also means reading, and its action is intimately related to the graphic design of the interface. In turn, for Whitaker (1998), navigation includes the virtual movement through cognitive spaces formed by the pieces of information and by the knowledge emerging from them. Next, we will present, from Lynch and Horton (1999), standards for the application of navigability in Web environments: Menu on the top of the page and menu bar; Navigation menus on the left side; Button menus; Navigation bar on the right side; Links to internal pages; Login boxes; Order buttons; External links; Website map; Avoid opening animations; Organize the content simply, clearly, and objectively; Show the user where they are.

To evaluate the interface of an application according to the user navigability criteria, some basic navigability rules may be taken into consideration:
3.5 eMAG, ACCESSIBILITY

Committed to inclusion, the Brazilian government sought to facilitate the access by all people to the information and services made available by the government websites and portals through the elaboration of the Electronic Government Accessibility Model (eMAG). The eMAG was developed in 2004 based on the study of fourteen standards existing in other countries regarding digital accessibility. The eMAG has eight guidelines, each with a set of recommendations (BRAZIL, 2005).

Such Guidelines do not define an implementation order, which is up to the Accessibility Level Model; however, they group the recommendations according to the perception of the result. According to Brazil (2005), the eight Electronic Government Accessibility Guidelines are the following:

- Guideline 1 - Provide equivalent alternatives for graphic and audio content;
- Guideline 2 - Ensure that your Website is readable and understandable even without the use of formatting;
- Guideline 3 - Give preference to markup and formatting technologies; Guidelines and recommendations to promote Web accessibility 196

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**Figure 1: Navigability Rules**

- The users are able to find the services that the environment proposes.
- The contract information is clear and accessible.
- The interface loads all pieces of information quickly, without presenting any errors.
- The interface does not present unnecessary information, pop-ups, or other items that may hinder the loading.
- The environment has a mobile version that allows the user to access my website using mobile phones or tablets.

Source: Drawn up by the author.
• Guideline 4 - Ensure that all information is interpreted correctly, with clarity and simplicity;
• Guideline 5 - Ensure that the technologies employed work in an accessible manner and are independent from programs, versions, and future changes;
• Guideline 6 - Always ensure the user's control over the navigation on the website;
• Guideline 7 - Identify the navigation mechanisms clearly;
• Guideline 8 - In cases not contemplated by the previous guidelines, always use resources acknowledged by institutions with ownership in the matter, such as accessible technologies.

After identifying some parameters that enabled us to create an assessment of the digital repository for educational podcasts, a survey-type form was drawn up based on the Usability, Navigability, and Accessibility criteria and, consequently, the use of the REEVES method for evaluating educational software, all described above.

4 RESULT

The final users of the Digital Repository for Educational Podcasts who are students in the Special Undergraduate Program for Training Professors for Professional Education and participated in the interview through this study's evaluation form include graduate students from various areas of knowledge. Ten participants were interviewed, hence allowing the evaluation of the repository interface regarding the Usability, Navigability, and Accessibility aspects, as we may observe in the sequence of charts that will be explored below.

4.1 ASSESSMENT OF THE INTERFACE CRITERIA

During the interview, inquiries were made regarding the usability and navigability of the interface of the digital repository for educational podcasts. The interface involves the visual organization with a simple and clean layout, promoting harmony, and qualifying the visualization by the user, as we may observe from the figures distributed below, which allow us to identify all the topics discussed in the evaluation form based on the inquiries of the ten criteria addressed in the Reeves Method (Proposes a methodology that defines two approaches for assessing educational software).
During the first section of the assessment, the Usability and Navigability aspects relative to the Repository were analyzed. In Figure 2, we may identify that 100% of the respondents found the interface intuitive and easy to use; in sequence, the aspects of the user's understanding of the tasks that must be performed in the environment were investigated, and 90% answered that the understanding is easy and intuitive, with only 10% not answering about this; another perspective that was analyzed refers to the documentation, regarding both usage tutorials and policy and copyright terms that rule the repository; as we may observe in question three, 100% of the respondents evaluated that the instructions and documentation about the Repository are clear and explanatory.

Figure 2: Analysis of the usability and accessibility criteria of the digital repository for educational podcasts.

1) You found the repository interface:
   - Difficult/Confusing
   - Easy/Intuitive

2) Understanding what must be done on each page is:
   - Difficult/Confusing
   - Easy/Intuitive

3) The instructions and documentation about the Repository are:
   - Poorly structured
   - Clear and explanatory

Source: drawn up by the author.

Moving on to the analysis of the results on Usability and Navigability, we may verify in Figure 3 that 100% of the respondents considered the interface as easily usable and intuitive; regarding the colors used in the Layout, 70% of the respondents found them Great / Very good; as for the response time upon performing a search in the repository environment, 66.7% of the respondents had a response beyond expected and 33.3% reported having a satisfactory response.
In Figure 4, we may observe that 90% of the respondents found that the environment returns the feedback immediately to the user and that the help system fulfills the role of helping with user doubts regarding navigation and use; in Question 9, it was asked to the respondents if the repository encourages the dissemination and sharing of knowledge, and 100% stated that the repository is indeed a great source of information dissemination and sharing.

At the end of the evaluation stage of the usability and navigability aspects, two questions were posed to the respondents, as we may observe in Figure 5, namely if the repository has a navigation interface easily usable and intuitive, obtaining 100% of positive answers, and if the repository stimulates the creativity of its users, with 90% of the respondents answering yes; hence, at the end of this assessment step, through the data collected, it is possible to understand that the Digital Repository for Educational Podcasts meets the usability and navigability aspects according to the users interviewed in the process of evaluating the environment.
4.2 ASSESSMENT OF THE ACCESSIBILITY AND INCLUSION ASPECTS - ACCORDING TO THE eMAG

The Electronic Government Accessibility Model (eMAG), in its version 3.1 (2014), emphasizes the following: "despite rendering the assessment of accessibility quicker and less laborious, automatic validators, on their own, do not determine if a website is accessible or not. For an effective assessment, a posterior manual validation of the interface elements is necessary.

The Electronic Government Accessibility Model (eMAG) was deployed with the expectation of rendering Web navigation more accessible to people with special needs through a standardized model that allows the implementation of digital accessibility aspects according to international standards proposed by the W3C and from Web content accessibility recommendations (WCAG), associated to the needs of the Brazilian population; according to such aspects, a sequence of questions was created to evaluate the accessibility of the Digital Repository for Educational Podcasts; below, we will analyze the answers of the respondents regarding this section:

Figure 5: Analysis of the usability and accessibility criteria of the digital repository for educational podcasts.

Source: drawn up by the author.

Figure 6: Assessment of the accessibility and inclusion aspects of the Digital Repository for Educational Podcasts.

Source: drawn up by the author.
In Figure 6, the respondents answered a sequence of three questions, with 100% answering that the repository has captions in its elements and that the links point to the pages and locations to which they propose; 90% believe that the repository environment meets the accessibility and inclusion aspects with excellence. In sequence, in Figure 7, we can analyze the questions concerning the description of the links and the functionalities of the Buttons, Menus, and Forms, with 100% of the respondents considering that such aspects are met in the structuring of the interface design.

Figure 7: Assessment of the accessibility and inclusion aspects of the Digital Repository for Educational Podcasts.

Source: drawn up by the author.

Following the analysis regarding accessibility, we can verify through Figure 8 that 100% of the respondents answered that the forms have descriptions that help accessibility, with 90% believing that the descriptions are laid out appropriately, as well as the operation of the forms.

Figure 8: Assessment of the accessibility and inclusion aspects of the Digital Repository for Educational Podcasts.

Source: drawn up by the author.
Analyzing the data in Figure 9 allows us to verify that 100 % of the respondents considered that the buttons have descriptions. However, only 77.6 % found that such descriptions are in line with the eMAG criteria. In Question 23, 100 % of the respondents made use of the information search system positively, receiving the results satisfactorily.

In Figure 10, we may observe aspects regarding the access to the information from the searches carried out in the repository, with 100 % of the respondents answering that the searches are easily accessible to the users, which lives up to the metadata criteria used during the implementation. Question 25 exposes the response of the users relative to the functioning of the accessibility bar resources, such as Increase font size - Decrease font size - Normal font size - High Contrast, with 87.5 % of the respondents believing that the functionality of the accessibility bar meets the role designated to it. Also, 88.9 % responded that the repository has navigation tips, including for the use of screen readers (audio description).
At the end of the assessment, the users are submitted to four questions regarding the navigation tips and the ease of understanding, with 90% of the respondents answering that the repository has navigation tips that are in line with the eMAG criteria and 88.9% answering that the tips are easily understandable for special needs users. At the end of the evaluation, 100% of the respondents answered that the repository has an environment that allows accessibility to deaf people through Vlibras (a set of tools used in the automatic translation from Portuguese into LIBRAS), as well as translations into Spanish and English, facilitating the understanding of users of different nationalities.

![Figure 11: Assessment of the accessibility and inclusion aspects of the Digital Repository for Educational Podcasts.](image)

Source: drawn up by the author.

After the assessment, observations, and analyses were performed, it is possible to consider that the interface of the Digital Repository for Educational Podcasts proved to be efficient regarding the usability, navigability, and accessibility criteria. At the same time, the Assessment enabled the final users to have the opportunity to present their difficulties, highlight the points that, from their analyses, should be improved, and suggest changes that, if implemented, may optimize the interface, facilitating the interaction.

5 FINAL CONSIDERATIONS

The results of this research bring relevant and positive information about the interface design used in the repository, having great acceptance by the interviewed audience. However, developing this study and performing the usability, navigability, and accessibility assessment allowed visualizing some issues from the final user's viewpoint. Therefore, it is crucial that the repository always perform upgrades taking into account the user suggestions, having the digital
accessibility guidelines in effect in the eMAG Model as a base, to mitigate the barriers that may affect the navigation autonomy of users with motor disabilities.

Lastly, it is known that educational content sharing is essential for the development of education, and the Open Access movement and digital repositories currently have an important mediation role in the sharing and recovery of scientific information. In this sense, the Digital Repository for Educational Podcasts emerges as an alternative for both the streamlining of the communication process and the management of knowledge among the different segments and target audiences that compose education.
REFERENCES

HIRATSUKA, Tei Peixoto et al. Contribuições da ergonomia e do design na concepção de interfaces multimídia. 1996.


LYNCH, P.J.; HORTON, S. Web style guide: basic design principles for creating web sites. New Haven: Yale University Center for Advanced Instructional Media, 1999.