Heuristic Evaluation of a Virtual Learning Environment

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SUMMARY

The article presents the process and the results of applying heuristic evaluation to a virtual learning environment adopted by the Centro de Federal Institute of Distance Learning of Espírito Santo – Brazil (CEAD/IFES-ES).

KEY WORDS (Design, Usability, Virtual Learning Environment)

1. INTRODUCTION

This research is part of a study which investigates the ergonomic evaluation of the usability of the virtual learning environment adopted by CEAD of the Federal Institute of Espírito Santo (IFES/ES) belonging to the Brazilian Open University (UAB). The heuristic evaluation was adopted in this research to discover if the interface of the environment (represented by Moodle version 1.9.5 software) presents usability and design problems which were not identified by other previously applied techniques.

This center was chosen for this research for two reasons, the first reason being that the institution identified that its students have great difficulty to interact with the learning environment. The second reason was that CEAD is part of the Brazilian Open University, a Brazilian government initiative which aims to provide high quality higher education teacher training. Therefore, it is possible that the problems identified in this study and the ergonomic recommendations suggested could be found and used in other UAB centers, as the vast majority of these centers use the Moodle software to present their virtual learning environments.

2. PROBLEM AND HYPOTHESIS

The virtual learning environments are not totally adapted to the needs of the users; this fact complicates the process of student interaction and impedes quality learning. From this problem the following hypothesis arises, that a lack of knowledge of the benefits of usability and ergodesign\textsuperscript{1} leads to the construction of inadequate and low quality Distance Learning (DL) software, which is unsatisfactory for students and teaching staff.

3. METHOD

According to Preece et al. (2005), the term “heuristic evaluation” was introduced by Nielson and Rolf Molich in the nineties. It consists of an inspection method of usability performed by

specialists in the field that use a set of heuristic principles as reference to assess whether the elements of a specific interface are in accordance with the selected principles. It is a simple, efficient and low cost method and can be applied at any stage of the development of the project. To apply this method it is necessary to select between 3 and 5 specialists who must examine the chosen interface in order to look for problems that go against the principles of good interface design.

4. APPLICATION

To aid the application of the heuristic evaluation, a checklist was developed with 117 items which assess the following points: **Visibility of the system status; Proximity of the system and the real world; User Control and Freedom; Consistency and Standards; Error Prevention; Recognition instead of memorizing; Flexibility and Efficiency of Use; Esthetic and Minimalist Design; Help the Users to Recognize, Diagnose and Recover Wrong Actions; Help and Documentation; Privacy; Navigation, Disorientation and Cognitive Overload.** These points of evaluation were defined based on the recommendations explained by Nielson, Bastien and Scapin, Shneiderman (Santos 2000) and Preece et al. (2005), in addition to consulting authors such as Padovani (1998) and Barnum (2002). Four specialists were invited with the following academic backgrounds:

- **Profile of Evaluator A:** Doctor of Design – PUC/RIO
- **Profile of Evaluator B:** Specialist in Ergonomics, Design and HCI – PUC/RIO
- **Profile of Evaluator C:** Master of Computer Science – Unicamp/SP
- **Profile of Evaluator D:** Specialist in Ergonomics, Design and HCI – PUC/RIO

The researcher met each specialist individually and each point of the checklist was discussed together with the visualization of the virtual learning environment. The average time of each assessment was two hours. After gathering all the problems which arose, the researcher sent them to the specialists individual grading. It was not possible to bring all the specialists together due to the availability of time and ease of access.

5. RESULTS

The problems encountered were passed on to the specialists to grade and distributed in accordance to the level of severity, 84% of the problems were rated as a catastrophe and major usability problem. The problems which stood out most were:

<table>
<thead>
<tr>
<th>Problem</th>
<th>Grade</th>
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<tbody>
<tr>
<td>Not all of the user’s entries are shown on the screen</td>
<td></td>
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<tr>
<td>There is no information for long processes</td>
<td></td>
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<tr>
<td>The identification elements of the page are not legible</td>
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<tr>
<td>The system terminology is not familiar to the user</td>
<td></td>
</tr>
<tr>
<td>The level of details of the system does not correspond to the reality of the user</td>
<td></td>
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<tr>
<td>The system uses hard to interpret abbreviations</td>
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<tr>
<td>The system has no function to clear any changes made by the user</td>
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<tr>
<td>The system does not present error messages about system failures</td>
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<tr>
<td>The system does not use standardized colors for links</td>
<td></td>
</tr>
<tr>
<td>The system does not support novice of experienced users</td>
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</tbody>
</table>
The colors used do not help to focus attention
The system does not have a menu with different levels of navigation
The system does not show the data required to perform any operation
The system does not use warnings when they are necessary
The system does not use captions to help the user read extensive and non-intuitive content
On cancelling an operation the system causes disruption to the workflow
The system does not show effective error messages
The “Help” link is not highlighted
The menus are not used, named and positioned consistently
The menu items do not give feedback when selected
The system does not provide more than a single way of accessing information (Indexes, paths, examples)
There is no basic layout for the screens.
The icons do not stand out on the screen
The system does not provide a query/search tool
The system does not allow pages of interest to be bookmarked
There are no Navigational instructions
The system is not suitable for all the error possibilities
The system does not aid reverse navigation

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<th>6. RECOMMENDATIONS</th>
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During the evaluation process the specialists made some recommendations and other recommendations were made after the general analysis of the scoring of each identified problem.

Visibility of the system status: All the entries for the user should be shown on the screen. The system should show information about long processes; this information can be performed through the use of colors and images. The identification of pages should be legible and easy to understand, avoiding abbreviations and codes.

Proximity of the system and the real world: The system should present visual information and terminology familiar to the reality of the user. Avoid using abbreviations.

User Control and Freedom: The system should present an action to delete any changes made by the user. The reverse navigation links should be legible. The system should allow the user to adjust their entry of data and display messages that indicate who is in control.

Consistency and Standards: The system should present consistent terminology for the texts. There should be a basic diagram of all screens; this diagram should enhance the blank spaces and the symmetry. Use standardized colors for the links and to code “status” or “continuity”.

Error Prevention: The system must be adapted for all possibilities of error. Present a new way of navigating, if this is not possible, the system should provide visible and standardized
instructions to help the navigation. The system should display messages if the user performs an illegal operation. The cursor of the mouse should be positioned in editable areas for the user.

**Recognition instead of memorizing:** The system should use captions to aid the user to read extensive and unobvious content.

**Flexibility and Efficiency of Use:** The system should support novice and experienced users, showing different dialogues for different users. Saturated and bright colors should be used to emphasize data. The system should have an effective menu with levels of navigation the user understands and organized in a hierarchical form. The system should offer options to choose between icons and texts for the user to access the content. To aid accessibility, the system should use resources from the keyboard for navigation.

**Esthetic and Minimalist Design:** The system screen should highlight important information to the user, it should show the data required to perform any operation. Warning features should be displayed to the user when necessary. The system should inform the user when an operation has been performed, colors may be used to represent this information. Icons should correspond to the reality of the user.

**Help the Users to Recognize:** The messages should be effective, specific and understandable. These messages should be assertive and constructive. If the user cancels an operation the system should not cause disruptions to the workflow. The system should provide quick access to the “help” link. The system should allow only the incorrect part of the entry to be corrected.

**Help and Documentation:** The Help link should be highlighted and should quickly enable system access. The system should use navigational aids. The system should show interactive tutorials.

**Navigation, Disorientation and Cognitive Overload:** The menus should be named and positioned consistently. The system should have provide more than one way to access the information, the inclusion of a horizontal menu in addition to the left hand side menu and visual maps is suggested. There should be a query/search tool. The links should be consistent.

### 7. CONCLUSION

The formulation of the checklist facilitated the heuristic evaluation, since the specialists used the checklist as a support tool for the analysis. The difference in academic training of the specialists could have been influential on the result, as the master of computer science focused more on analyzing the security, speed and functionality of the system. The Doctor of design placed more importance on the bad use of graphical elements on the interface and the experts specialized in HCI focused on the usability problems of the environment. The specialists had great difficulty in evaluating the item “Equivalence between the system and the real world” as the claimed they were unaware of some terms which are familiar to the users.

It was possible to identify other usability problems which were not detected by the other
investigative techniques, for example: the system does not support novice and experienced users; the colors used on the system do not help in directing attention; the system does not have a menu with different levels of navigation; the help system does not quickly enable system access.

The results and the recommendations were analyzed and presented to the team of the CEAD/IFES to evaluate and to provide immediate solutions to the most severe problems.

8. REFERENCES


