

Ergonomic Evaluation of Usability with Users – Application of the Technique of Cooperative Evaluation

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Abstract. This paper presents the application of a cooperative evaluation, technical evaluation performed ergonomic usability with users in the Learning Management Systems (LMS) used at the Instituto Federal de Pernambuco (IFPE). The data collected in the assessments were analyzed with users from Nielsen usability heuristics. The results showed that the environment has evaluated a large number of usability problems.

Keywords: Cooperative evaluation, usability, Learning Management Systems.

1 Introduction

The e-learning is characterized as an educational modality in which mediation didactic and pedagogical processes of teaching and learning occurs with the use of media and information technologies and communication with students and teachers developing educational activities in different places or times (MEC, decree No. 5.622/05).

According to Moran [1], in the teaching / learning between teachers and students of e-learning used mainly telematic technologies, such as the Internet.

To mediate the interaction between those involved in the process of e-learning, Araujo Junior [2] states that may be necessary to use a Learning Management Systems (LMS). A LMS for its features and tools available, is a tool of interaction in the learning process, based on the features available on the Internet.

Interaction tools must be very efficient, allowing your users to be highly productive in their work [3]. According to Cybis [4], unsuccessful interactions not only annoy users and cause for frustration and loss of self esteem.

In order to obtain a good interaction, it is necessary that the tool has good usability, which is defined by ISO 9241 as "the ability of a product to be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use".

Preece [3] list many technical usability evaluation which can be used in different ways and in different patterns. Among these techniques, the cooperative evaluation.

2 Theoretical Framework

This topic explains, from literature, the theoretical foundation of the issues relevant to meet the objective of the research, a cooperative evaluation of the virtual environment IFPE.

2.1 Learning Management Systems

With the support of the Internet and communication technologies that enabled more effectively, especially from the 90s, the distance has been improving as a teaching modality capable of meeting the difficulties of geographic distance and time between students and teachers.

According to Martin-Brabero [5], with the technological resources we have to learn a new method and this task is made much more wealth by the computer.

A LMS can be defined in the user's perspective, as an environment that simulates face learning with the use of information technology [2]. Equivalently to-face classrooms, Learning Management Systems constitute themselves as a place to carry out educational activities. In virtual environments, we can publish, store and distribute educational materials, but also realize the communication between students and support staff. All these processes must be mediated by the interaction between people, content and tools involved.

The term Learning Management Systems refers to the concept of space resulting from the learning opportunities available through information technologies, characterized by Valentini [6], as a space where cognitive-social interactions occur, enabled by the GUI.

Franco [7] points out four strategies were followed in the development of the first virtual environments in the mid-90s:

- Incorporating elements already available on the web, such as electronic mail and discussion groups;
- Add elements to specific activities of computer, managing files and backups;
- Create specific elements of the educational activity, such as modules for content and assessment;
- Add elements of academic administration of courses, students, evaluations and reports.

Through these strategies were created the first LMS seeking a specific use in learning activities.

Currently available are various Learning Management Systems such as Moodle, Teleduc, AulaNet, among others, developed both by educational institutions and by public and private companies, each with its particular characteristics, with each institution to conduct a contextual analysis identify the most important variables that may constrain or promote particular learning process.

Communication Tools. According to Cabral [8], the process of interaction between students and teachers is accomplished through communication tools. There are two groups of these tools:

- Synchronous tools: are those that enable communication between those involved in real time, with a "resemblance to the classroom, because they constitute a more spontaneous, which leads us to use language more relaxed and closer to the student" [8]. Examples include chat rooms, teleconferencing, instant messengers. The asynchronous tools have a more immediate, leading those involved to equity reflected or less superficial.
- Asynchronous tools: this group, the message sent by a participant is received and answered later by others, ie, those involved need not be connected at the same time so there is interaction. Examples are the bulletin board, discussion forums, e-mail. The asynchronous tools promote a more critical and reflective of the participants, since there is "more time" to think what will be placed at each entry. One purpose of these tools is the socialization, stated by Cabral and Cavalcanti [8].

2.2 Usability

Usability is defined by ISO 9241 as "the ability of an artifact to be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use". The effectiveness with which the user will achieve their goals means he is able to perform the task successfully. The (lower) time this task is performed with regard to efficiency. The satisfaction, in turn, defines how the system is acceptable to the user [4]. Consisting of objective aspects, such as productivity in the interaction, and subjective, such as user satisfaction in their experience with the artifact, the definition of ISO proves to be quite flexible.

Usability can also be defined as a synonym for ease of use of something [9]. Greater ease in learning and memory, faster task completion, lower error rate and higher user satisfaction with the system are a reflection of a greater usability of an interface.

Having easy to learn, allowing efficient and have few errors are aspects that return the user a perception of good usability [9].

Usability Evaluation of Interfaces. According to Preece [3], the evaluation of an artifact helps to ensure that it will satisfy user needs. Cybis [4] states that the evaluation techniques and ergonomics are based on diagnostic checks and inspections of interfaces looking for problems of interaction between the user and the system.

For carrying out the evaluation of usability of the interface of a system, a technique that can be used is cooperative evaluation [3].

This technique, based on notes, audio, video and interaction logs, search for information related to how the user behaves in its natural environment and identification of errors during the use of the interface routes. Penha [10] divides this technique in four steps: Recruitment, where he must recruit one or more users similar to user type system, Task List, where the appraiser must specify the tasks to be performed by users; Conduct of sessions, where the assessor will observe and take notes, and briefing, where the assessor will talk to users after the completion of tasks, looking for more information.

Usability Heuristics. Several researchers in usability and human-computer interaction, in recent decades, have established lists of principles for design of interfaces and software systems for web environment, also called ergonomic criteria, from experiments and scientific methods. These criteria are used in the classification of the problems encountered in assessing the usability of interfaces.

Penha [10] puts ten fundamental principles that must be met by an interface so that it offers good usability:

- H1-Visibility of system status
- H2-Compatibility between the system and the real world
- H3-Freedom and control to the user
- H4 Consistency and standards
- H5-Support for the user recognize, diagnose and recover from errors
- H6-Error prevention
- H7-Recognize instead remind
- H8-Flexibility and efficiency of use
- H9-Design aesthetic and minimalist
- H10-Help and documentation

Nielsen's heuristics are widely used in research related to the process of man-machine interaction, and thus the usability. According to Santa Rosa [11], in a paper on research on mapping the design of interaction in e-learning in the international arena, it was found that Nielsen is a common references used in the research, part of 60% of cases.

3 Object of Research

The IFPE offers courses in the distance on the technical level, higher and postgraduate. The evaluations performed on this cooperative research were carried out using the environment of the graduate in Environmental Management. The virtual environment has the IFPE MOODLE platform software.

In this environment, students have the following features at your disposal:

- Contact: e-mail address to support the environment.
- News: Local users to post announcements.
- Messages: access tool for communication among the participants of the environment that are part of the student's contact list.
- My Courses: A list of the disciplines in which the student is enrolled, allowing access to specific content thereof.
- Users Online: Access the list and profile of the course participants connected and option for sending messages.
- Administration: Access to the table notes, reports and student profile.
- Participants: List of participants accessed the course.
- Activities: Access to specific types of activities undertaken in the discipline (chats, forums, surveys, questionnaires, resources and tasks).
- Calendar: Indications for major events such as exams and due jobs dates.

All options described above are common to all students and follow a standard content, except for the agenda of the course that will have its content varies according to discipline. For students enrolled in the same discipline, the agenda of the course will present the same content.

4 Cooperative Environmental Assessment DEAD / IFPE-PE

The evaluation was performed cooperative with eight users. Instructions for completion of the evaluation, and a list of tasks were previously transmitted to users. Cybis [4] states that this technique is primarily useful for obtaining qualitative data.

The tasks to be performed by users should be as follows:

1. Access the virtual environment IFPE: <http://dead.ifpe.edu.br/moodle/>
2. Log into the environment from the user specified;
3. Edit your profile (change image, insert description, change password);
4. Access the Course "Sistemas de Informações Geográficas";
5. Access the Course Calendar and find out the commitments of the month of May;
6. Access the Material "Aulas 1 e 2";
7. Perform the deployment of Task "Envio de arquivo 6";
8. Enter a post on the sixth week, the topic Classroom attendance;
9. Enter a message in the Chat online tutoring, one week;
10. Send a Message to Tutor Carlos Viana;
11. Visit the Notes;
12. Log off.

Before the evaluation the users were informed that the evaluation focus would be directed to the interface [10].

With respect to age, users concentrated in the range 24-35 years. According to Santa Rosa [11], there is no set age for students in distance courses.

The degree of training of participants was divided equally into high school and college. On the issue of computer experience, the majority uses the computer daily and surfing the internet for over three years.

Finally, regarding the past use of MOODLE, only two users had used the environment of other institutions, but sporadically. Most users of the research participants (75%) used the environment for the first time conducting the evaluation.

The observations made by users and difficulties encountered by them in carrying out tasks stipulated in the report were recorded by the researcher. According to Preece [3], observations can be made in a controlled environment (laboratory) or natural (field), which can occur anytime, anywhere. This research was conducted in the natural environment of each user.

Completed the evaluation, users were free to express their opinions about the usability and user interface environment.

The reports were subsequently analyzed for patterns or significant events [3], is also highlighted unexpected behavior, subjective comments from users about the interface and the heuristics of Nielsen violated in each task.

4.1 Analysis of Cooperative Assessments

The average time spent by users to perform the proposed tasks was 25 minutes. The two users who said they have used MOODLE previously carried out the assessment in times similar to other users.

After analyzing the problems identified from the assessments carried out by cooperative users, it was observed that only heuristic H10 was not violated. Some tasks presented problems that fall in more than a heuristic.

- Task: Login to the environment

Most users could accomplish the task quickly, but it was necessary to roll the home in search of the field access. One of the users confused the banner help with the field access and clicked on it several times until I realized I was on a banner.

In contrast, several participants were in doubt whether they were actually logged as none found any visual clue indicating the success of the operation. Only those that rolled all found the confirmation page, located at the bottom of the layout.

User reviews: "Why is log into this position?"

"Normally the log is over."

"I think that I have accessed the system. We did not see was logged. "

"He entered? Where the user name?"

Heuristics violated: H1 / H4 / H7 / H9

- Task: Edit profile

One participant was unable to perform the task. All others had difficulty in accomplishing this task. In general, participants sailed several times by the home environment for a link to edit profile without success. Most users could access the profile editing page by chance, by clicking on the name of the logged in user. None of them could change the profile picture. One of the participants in the search for some way to make the change of image, which had lost the description entered. One user complained that it did not understand the meaning of the options available on the "Edit Profile" to be very technical.

User reviews: "My God, how to change that picture?"

"I'm not able to find."

Heuristics violated: H3 / H5 / H8 / H9

- Task: Access course

From the homepage of the environment, all participants were able to perform the task without difficulty. However, none of them used the option group "My Courses". All rolled down the page to find the course content.

To return to the course after accessing other pages, most used the browser's back button. One participant clicked on the course code available in the path of the page accessed, but it certainly was right.

User reviews: "I think it's here." (Trying to return to the course)

Heuristics violated: H4 / H8 / H9

- Task: Access Calendar

Only two users quickly found the feature "Calendar", located on the right side of the screen. Most searched initially in the left hand menu interface. To get to the month requested the task, all using the navigation arrows, which is month to month.

User reviews: "You can not enter the month you want?"

"It takes time to come."

Heuristics violated: H3 / H5

- Task: Access material

Some users sought for materials primarily a link from the menu on the left corner of the layout. So many of these, like others, have managed to successfully access the material, but some were in doubt whether they had successfully done because the material is slow to load was not given any information about the charging status.

Heuristics violated: H1 / H8

- Task: Submit Job

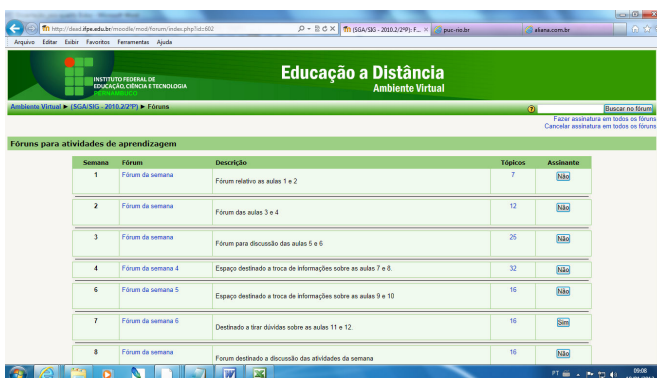
All participants were able to access the page to send the task quickly through the "Tasks" menu located on the left of the Layout. Some users were in doubt whether the file was actually being sent because the system does not display the progress of the process. The confirmation is provided only after completion of the transmission.

Heuristics violated: H1

- Task: Enter a message in the forum (week 6)

Most users accessed the page quickly through the forums link "Forum", located on the left side menu of the Layout. When accessing the forum indicated, however, some participants made the wrong choice, because the name of the forums does not match the week indicated. The forum 6 is on the fifth week (Figure 1).

Heuristics violated: H7



Semana	Fórum	Descrição	Tópicos	Assinantes
1	Fórum da semana	Forum relativo as aulas 1 e 2	7	Ir
2	Fórum da semana	Forum das aulas 3 e 4	12	Ir
3	Fórum da semana	Forum para discussão das aulas 5 e 6	25	Ir
4	Fórum da semana 4	Espaço destinado a troca de informações sobre as aulas 7 e 8	32	Ir
6	Fórum da semana 5	Espaço destinado a troca de informações sobre as aulas 9 e 10	16	Ir
7	Fórum da semana 6	Destinado a tirar dúvidas sobre as aulas 11 e 12	16	Ir
8	Fórum da semana	Forum destinado a discussão das atividades da semana	16	Ir

Fig. 1. Screen Forums

- Task: Enter a message in chat

In general, participants accessed the chat through the "Chat" located at the left side menu of the Layout and performed the task successfully. But for this it was necessary to return to the homepage of the environment. One user questioned the lack of a link that allows direct access of the forum page of the task prior to the chat page.

User reviews: "It has the menu on this screen?"

Heuristics violated: H8

- Task: Send a message

Most users first tried the "Messages" menu on the left side of the layout. After several visual search, the block "Messages" was located. Some tried to locate the tutor Carlos Viana via the link "Participants", but were unsuccessful because this function only lists the users in the course that is currently active in the research. Those who could, at first thought they had made a mistake, for it displayed an error message (Figure 2).

User reviews: "It was hard. The group is isolated."

"He mistake?"

Heuristics violated: H1 / H2 / H5 / H6

- Task: Access notes

All participants performed the task successfully and without difficulty.

- Task: Logging off

Most users tend to search for the "Exit" button at the top of the layout. Only after rolling the page were a few times, the job was located. Some users complained about the font size of button.

User reviews: "It's hard to find out because he is down there."

Heuristics violated: H4 / H9

The figure 3 shows the number of heuristics violated in each of the tasks performed by users. Note that the tasks "Sign", "Edit Profile" and "Send message" showed the largest number of heuristics violated, each with four.

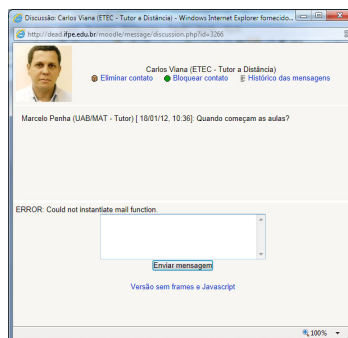


Fig. 2. Error Message Screen

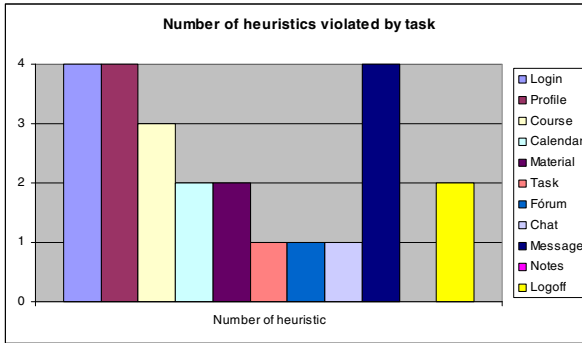


Fig. 3. Number of heuristics violated by task

With respect to frequency, the heuristics H1, H8 and H9 are those with the highest number of occurrences, each in four different tasks, as shown in figure 4.

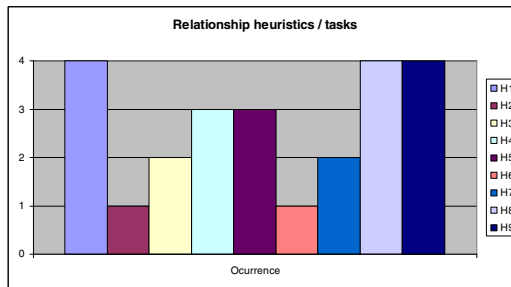


Fig. 4. Relationship heuristics / tasks

5 Conclusions

The chosen technique for usability evaluation was effective in pointing out many usability problems. It also proved possible, considering that the number of members required to obtain good results is not high.

The evaluation was a cooperative and active participation of users, who at times showed to be very excited to be able to weave their views and were happy to contribute to research.

The results obtained from the tests applied in the case study showed that the virtual environment has enjoyed usability deficiencies, creating an interplay of low quality and, at times, unpleasant for the students. Some of the tasks posed ended up not being made by some participants.

Overall, the results pointed to the lack of basic principles of design and usability, content as too long and sometimes unnecessary, lack of standard layout, inappropriate language and messages in inconsistent placement of some features.

References

1. Moran, J.M.: O que é educação à distância (2011), <http://www.eca.usp.br/prof/> (accessed on May 2011)
2. Araujo Jr., C.F., Marquesi, S.C.: Atividades em ambientes virtuais de aprendizagem: parâmetros de qualidade. In: Educação a distância: o estado da arte / Fedric M. Litto, Marcos Formiga, pp. 358–368. Pearson Education do Brasil, São Paulo (2009)
3. Preece, J., Rogers, Y., Sharp, H.: Design de interação – Além da interação homem-computador. Bookman, Porto Alegre (2005)
4. Cybis, W., Betiol, A.H., Faust, R.: Ergonomia e Usabilidade, conhecimentos, métodos e aplicações. Novatec Editora LTDA, São Paulo (2007)
5. Martin-Barbero, J.: Cultura y Nuevas mediaciones tecnológicas. In: Martinbarbero, Jesús. América-latina: otras visiones de La cultura, CAB, Bogotá (2005)
6. Valentini, C.B.: SOARES, Eliane Maria do Sacramento. Aprendizagem em ambientes virtuais: compartilhando ideias e construindo cenários. Educus, Caxias do Sul (2005)
7. Franco, M.A., Cordeiro, L.M., Fonseca del Castillo, R.A.: O ambiente virtual de aprendizagem e sua incorporação na UNICAMP (2003), <http://www.scielo.br/pdf/ep/v29n2/a11v29n2.pdf> (accessed on May 2011)
8. Cabral, A.L.T., Cavalcante, A.F.: Linguagem escrita. In: 20% a distância: e agora: orientações práticas para o uso de tecnologia de educação a distância / Alda Carlini, Rita Maria Tarcia, pp. 53–80. Pearson Education do Brasil, São Paulo (2010)
9. Nielsen, J., Loranger, H.: Usabilidade na Web - Projetando Websites com Qualidade. Campus, Rio de Janeiro (2006)
10. Penha, M., Campos, F.: CORREIA, Walter Franklin Marques. Mapeamento da pesquisa sobre design de interação na educação a distância no cenário internacional. Revista Científica Tecnologus 5, 1–24 (2010)
11. Santa Rosa, J.G.: MORAES, Ana Maria de: Avaliação e projeto no design de interfaces. 2AB, Rio de Janeiro (2008)