Emotional design and human factors design as tool for understanding efficiency information design process at medical documents

Mariel Garcia-Hernadez [1], Fabiola Cortes-Chavez [2], Marco Marin-Alvarez [1], Alberto Rossa-Sierra [2], Elvia Luz Gonzalez [3]

[1] Universidad Autónoma Metropolitana, Unidad Azcapotzalco, Av San Pablo Xalpa 180, Col. Reynosa Tamaulipas, CDMX, 02200, México.
{al2173804149@alumno.azc.uam.mx, marma}@correo.azc.uam.mx
[2]Universidad Panamericana, Facultad de Ingeniería, Álvaro del Portillo 49, Zapopan, Jalisco, 45010, México.
{fcortes, lurosa}@up.edu.mx
[3] Universidad de Guadalajara, Centro de Investigaciones en Ergonomía, Calzada Independencia Norte No. 5075, Huentitán El Bajo, Guadalajara, Jalisco, 44250, México
elvia.gmunoz@academicos.udg.mx

Abstract. This work will focus on improving the design that currently has medical documents, specifically results of blood chemistry used in Mexico, which are not designed to be understood by the different users who really interact with this product. It is important to propose a taxonomy of the different users that interact with the documents that correspond to the results of clinical analysis, in order to develop products that are focused on the cognitive requirements of each of them.

Keywords: information design, ergonomics, user centered design, medical documents, emotional design.

1 Introduction

The study of ergonomics is essential, we must know the person who will be behind the product, it is necessary to know it and study its needs as its limitations to be able to understand what type of object needs, with all the characteristics and specifications that it requires. Each user is different, and it is necessary to group them according to their personalities, limitations, needs, etc. [1] Currently, the literature shows that it is essential to develop products that are focused on the needs of the end-users, however there are still few products and services that have been developed focused on the needs of a specific user, thus causing an increase in the risk of errors and understanding of them.

This work will focus on improving the design that currently have medical documents specifically results of blood chemistry used in Mexico, which are not designed to be understood by the different users who really interact with this product. These contain

information that only the doctor or health officer could understand, however, other users such as the patient and / or the patient's family member are not contemplated, which generates misunderstanding of the information that is being presented to them. It is important to propose a taxonomy of the different users that interact with the documents that correspond to the results of clinical analysis, in order to develop products that are focused on the cognitive requirements of each of them.

Ergonomics in the design plays a fundamental factor at this time, since the design of the information is not addressed in a way appropriate to the cognitive needs of all users, errors occur and loss of time for users, when they generate documents that do not invite reading; instructions that are not understood and generate frustration, ambiguous information and excessive fatigue for those who interact with these devices. [2]

This is why this work seeks to demonstrate the importance of addressing the cognitive and communication requirements from the design strategy of the products previously mentioned to the end user. As well as the current information generated by chemical laboratories is inefficient, since it is directed only to users of health specialists (doctors, nurses, laboratories) and does not consider that there are other users of this product, such as the patient, and / or the patient's relative. Not being designed for all users, the product does not meet the needs of the latter, resulting in an inefficient design. Finally, it is shown that there are different types of users for this product.

With the results of this study, a design proposal was generated that can support information designers so that the algorithm found in the results can generate an extra scale, focused for the group of users who do not work within the area of the health, with this the designer will get a product that increases compression efficiency when considering all users.

2 ISO Standard

The ISO standards IEC 62366-1, 2015, ISO 13485 2016, in the area of medical devices and usability have clear rules about the importance of safety and specify the obligation of designers or developers to detect user needs before the design process. [3]

3 Who is the user

Speaking of who is the user? In a study by Syed Ghulam and Ian Robinson of Brunel University, a literature review of 556 articles was conducted to identify who were the users to which each document referred. With the information, we conclude that all the documents speak of different users and they were given the task of proposing a grouping of them, generating two large classes of users: main users that include the following groups: health professionals, patients, careers, people with special needs, trainers and students, and secondary users including groups: researchers, others, students and trainers. Each of these groups is divided into different types divided into subtypes,

where family members were in a subtype. This means that family members will be considered low users. [4]

The study concludes: A formal definition of who the users are, are missing, Information about all of different users it's necessary, all users are different from each other, all users are important, and should be ranked according to their function. [4]

The object leads the user experience, Designers need to consider all the experience as behavioral, expressive and physiological feelings. Designer must visualize before and during the design process. [4]

The FDA agree that some errors coincide with the poor design of medical devices, designers need to give importance to Human factors to understand the real needs of users, during the design process. [5]

4 Scenario based design method

The scenarios are an integral part of the international standard for the usability engineering of medical devices (IEC 62366: 2007) [6]

The method analyzes how an object or interface will be used in the future and provides to all the types of user, the needs that must be met at each time and stage of the product. "The scenarios are based on observational studies and future projections with the analysis of data."[7]

5 Information design requirements and cognitive ergonomics

W we talk about design for usability, we refer to any decision that is aimed at developing design artifacts that take the user and their needs as a central axis. [8] The author states that the design for usability includes two user items; physical characteristics and cognitive characteristics. The author refers to physical characteristics to all those considerations that the designer must consider for the development of any design artifact that are related to the user's physical morphology; weight, height, age, etc. In terms of cognitive characteristics, they are those that refer to the skills, knowledge, experiences and beliefs of the user regarding the design artifact and the context in which it interacts with it. [9] A design oriented to usability has the purpose of covering both characteristics in correlation with the context of use and usability requirements of the design product. However, due to the object of research study we will focus specifically on the cognitive characteristics of the user.

The graphic interfaces, must cover the cognitive needs of their users. [9] These needs, are the following; reduce cognitive effort, minimize the error rate during reading, require a lower learning effort on the part of the user, simplify representational transformations of information, match the memory of intermediate states to solve problems, improve performance, productivity and efficiency to perform a task related to

the graphical interface increase the reading and browsing comfort through the information that is presented in the graphic interface with respect to the user. [8]

These needs can be included in three important requirements to be covered by the interfaces:

1. Be effective. When we talk about effectiveness in the interface we mean that the information it contains can be easily understood by the user.
2. Be usable. Referring to this term, we would like to point out that the interface is easy to use and that the elements that make it up do not generate visual noise or visual bumps during the reading of the interface.
3. Be nice. The interface must be aesthetically pleasing to the user, since by being so we can infer that it satisfies visually.

Emoticons are graphic representations of an easy expression or physical body; these forms are embedded in human communication. [10] These representations compensate for the lack of non-verbal information, [11]. Also, the use of emoticons increases the understanding of nonverbal of the meaning. Emoticons express more emotional information than written text [12]. The use of emoticons is associated with strengthening the message, so this could be useful for those users that doesn't have knowledge about medical or technicalities about items that can be seen in the results of clinical analysis terms. As a contribution of this research work, we designed a Likert scale using emoticons. On the Likert scale emoticons green, and orange yellow were used. The green color was used to represent the normal reference values of the elements presented in the results of clinical analyzes. Yellow was chosen to represent slightly higher or lower values than those that could be within normal range. On the other hand, orange was chosen to represent higher or much lower values than those represented by the yellow color. The choice of this color coding was taken from the Human Engineering Committee of the Association for the Advancement of Medical Instrumentation (AAMI), [13]. There is a color coding that is related to the different warning parameters in medical devices. This color coding is:

6 Hypothesis

Seeing from strategy design information to the end user, especially those who do not belong to the area of health, decrease their level of uncertainty receiving the results of clinical tests, if they are presented supported emoticons and color scales.

7 User

It was taken as the end user profile sheet laboratory results. The study considered that the participant was between 25 and 44 years old, with a minimum high school education, with a medium-medium high socioeconomic level, also that will reside in the city of Puebla and Guadalajara.

8 Experiment

The usability test aimed at the following points:

1. Compare which of the two editorial proposals was the most effective (in
2. as for the understanding of the information) for the user.
3. Compare which of the two editorial proposals was the most pleasant for the user (reader).
4. Compare which of the two proposals was the one that generated less stress for the user.

For the development of the usability evaluation, the total user sample was divided into two groups, using the A / B Test tool.
The editorial proposals that were developed for this usability test were the following: (Fig.1a,b)

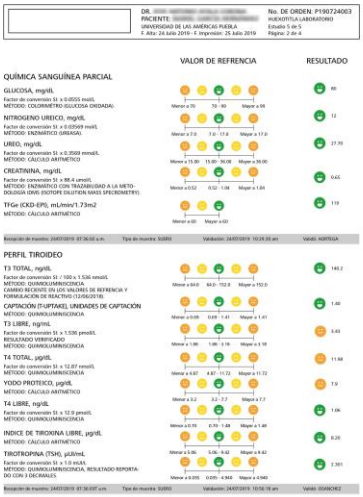

Fig. 1a. Proposal “A”

Fig. 1b. Proposal “B”

An electronic form was used through the survermonkey.com platform, one for the “A” proposal and the “B” proposal, the “A” being the re-designed design piece and the “B” proposal the original proposal.

9 Results

The results of the A / B test were as follows:

1. Variable "Effectiveness":

Observations: We find that the proposal "A" is clearer than reading with 37.5% in the premise "totally agree". Likewise, the same editorial proposal presents a greater understanding between the numerical result and the level that level represents. As also, this proposal is easier to understand than "A".

2. Variable "Satisfaction":

   Observations: According to the items corresponding to this variable, the proposal “A” is the one that presents the highest qualification regarding the user's satisfaction with it. We can observe that this user is visually more pleasant to the "A" proposal than to the "B" proposal, just as he feels more satisfied with the presentation and arrangement of the information.

3. Variable "Stress Level":

   Observations: After analyzing the corresponding graphs this variable, we can determine that the proposal "A" generates much less stress to the user that the proposal "B". Being the proposal "A" the highest qualified with variables ranging between "very quiet" and "quiet", unlike the proposal "B", where the "uneasy" reagent ranges with 50% preference.

After presenting the previous results, we can establish that the proposal that presented a better level of efficiency, effectiveness and satisfaction was the "A". Therefore, we can say that the use of emoticons and color nomenclature within a scale helps the understanding of the information presented to the user. Also, it reduces the stress you may feel at the uncertainty of the results themselves and make more palatable the data contained in the result set of clinical analysis.

10 Future works

In future projects it is recommended to work on the impact of emoticons on the patient's health status, this under the assumption that doctors need the patient to be optimistic about their health status. In this way, generating a state of less stress during the patient's recovery process.

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