# Analysis of the Non-Functional Requirement Usability in E-commerce's Sites

**Abstract**

It is important that information systems dealing with day-to-day information be easy to use. Progress made has made possible the construction of better user's interfaces. With the advance of the graphical user interfaces (GUI), people with no computer education are using some organizations' web site to perform several of their day-to-day tasks, like supermarket shopping.

Given this context and realizing the difficulties some women have every month when they try to buy groceries online, we decided to work on an interface comparative analysis of the four largest Supermarket sites. For that, we used the non functional requirement (NFR) usability taxonomy.

## 1. Introduction

Since information is the blood of modern companies; organizations are putting forward their web pages in order to position them selves on a new way of performing business, so it is extremely important that information systems dealing with day-to-day information be as useable as the ones geared towards wider audiences, such as the organization web sites. [FERR02]

Due to the great value of information, the user interface becomes an important part of information systems. It is the visible part of the system and where the dialogue between man and machine is established. It is necessary to design user-friendly interfaces, that is, interfaces that are easy to use. To be friendly, an interface must suit each user's need and satisfy his/her expectations.

Progress made on client oriented languages environments such as Visual Basic, has made possible the construction of better interfaces. With the advance of the graphical user interfaces (GUI), computers became very popular all over the world. Brazilian people, many of them with no formal computer education and not even used to use computers daily, are now using some organizations' web site to perform several of their day-to-day tasks, like supermarket shopping.

The Information and Technology market in Brazil is around 15 billion US dollars per year, and this market is considered to be one to the top 10 markets in global terms. It is also a fact that the Internet has been growing at very a fast pace, being Brazil today one of the countries with the fastest growth rate in Internet usage [http_1].

Even though women are the majority consumers of every shopping center, on the web they are responsible only for 23% of the shops [YESI99]. Since women are great consumers, we started to think about why don't they buy?

Given this context and realizing the difficulties some women have every month when they try to buy groceries online, we decided to work on an interface comparative analysis of the four largest Supermarket sites.

We chose to analyze: Carrefour, Sendas, Zona Sul, and Rede Pão de Açúcar. But at the end, we only perform our analysis on three sites. We will see later that Carrefour's site could not be analyzed for technological problems.

In this analysis, we will be focusing on the interfaces extracted from the buying processes of the four sites. For that, we used the non functional requirement (NFR) usability taxonomy [FERR02_B]. We will not be analyzing the speed of the site, even though we know that this characteristic is an important competitive advantage for those who explore it.

The construction of a good interface depends mostly on the complete diagnosis of its users. The software development process must be "user centered"; the interface must be designed bearing in mind the need to attend to the user's necessities [NORM86].

In this process, activities during the analysis must lead to information about the users, their tasks and about the application domain. The designer must know his target to be able to design the ideal site for his enterprise. Many times, a simple interface will end up being more communicative and easy to use than the more complex one.

The Internet is a highly competitive market. Online consumers that encounter a difficult situation during the buying process on a website will go away and buy at another website.

## 2. The Requirements

The communication between users and an Information System (IS) is established by means of the IS interface. A good IS design must guarantee a transparent communication, that is, it must assure that when a user access the IS to perform any task, he only needs to focus his energy on the work he wants to do [NORM86].

To have users focusing their attention mainly on their tasks, the process of software development must be "user centered", that is, its interface must be designed with the objective of satisfying the expectations and needs of users [NORM86] The design of an interface that considers users' characteristics and the NFR usability is a difficult process for many reasons, but most of this difficulty can be traced to the lack of attention on NFRs during the system definition process [FERR02_B].

We decided for our analysis to use only the non-functional requirements – The non-functional requirements are concern the site's quality [LEIT95]. Functional requirements were not used at this analysis due to the fact that there was not access to this kind of information. The non-functional requirements that a good interface must have may be grouped in two different categories: *requirements related to information exhibition* and *requirements related to data entry*.

Our approach is a qualitative one, that is we used the NFR usability taxonomy [FERR02_B] to analyze the interfaces of four information system pointing out the problems that an organization may find when the NFR usability is not taken in consideration.

Our results are presented with the sole intention of showing how important is to consider NFR as early as possible during the process of system construction.

**Requirements Related to Information Exhibition**
To build efficient interfaces based on the exhibition of information, some requirements must be followed:

**Consistency** [FOLE90]
Consistency is one of the main features for the usability of an interface. It helps to avoid the frustration induced when a system does not behave in an understandable and logical way. Moreover, allows a person to generalizes the knowledge about one aspect of the system to other aspects [FOLE90]. To be consistent, menus, commands, information exhibitions, and all the functions of an interface must have the same visual presentation.

**Feedback** [FOLE90]
In any form of communication, feedback is very important. When two people talk, they are constantly giving each other feedback through gestures, expressions and others. In order to obtain a good interaction of a person with a computer, good feedback must be supplied, however in this in case, they must be planned and be programmed [FOLE90].

**Ability Levels and Human Behavior** [APPL92]
Since an interface must be designed in such a way that it can be used by experienced users and by beginners, it must have some peculiarities.

**Human Perception** [PRESS92]
The perception of each person depends on hers abilities to perceive and to treat information. Variations of physical abilities, behavior and personality influence the success of a system. Each user possesses a cognitive style that determines how he perceives the information. To create an interface that in fact can be used by different people, it must be possible to display its content in different forms in order to accommodate the different perceptions. Despite the trend if using graphical elements in the web sites design, much information continue to be give in the literal form. Reading constitutes an essential activity in many systems. The text size, the font source, upper/lower case, the location and color are factors that directly affect the easiness with which the information is perceived, that is, its usability.

**Minimization of memory charge** [FOLE90]
A good interface invokes the user's recognition rather than recall memory whenever possible. Many sites sometimes forces unnecessary memorization. We see that few mnemonic names and not well-designed icons are often used. Since the signs (icons, command's names etc.) are the essential elements of a screen, they must be well produced. During development process, the designer must pay attention to the choice and design of the signs so that that they do not induce doubts [PRES92].

**Functional Classification of Commands** [FOLE90]
The menu's bars offer may options the user; they consist in a good way to access functions not constantly requested. It reduces the memory load for the users and Its content depends on the site, but generally, the several pages of a site have similar bars, with its items arranged horizontal or vertically.

When a menu's item is chose, it can show a sub-menu below it (pull-down menu or hierarchical menus); in this in case, the names of the items are located one below another. One of the advantages of a pull-down menu is that it is called only

when it is necessary, thus saving screen space, without polluting the screen and without offering a series of options that can confuse the user.

**Use of colors** [FERR99]
The color, basic element in any communication 's process, may interfere with emotions and cognition process of a person [MARC87]; it can deliberately be used to reach specific objectives. The combination of colors must be carefully chosen [JACK94], [MARC87] and [FERR99]. The appropriate use of colors may help to produce a quick and correct assimilation of the information. Its inappropriate use may turn the information incomplete, ambiguous or intelligible for the user. Its impact in the effectiveness of the interface depends on the relevance of its use for the performance on a task and on the situation and environment where the task takes place [SMIT87_A].

**Requirements Related to Data Entry**
To make the interfaces more powerful regarding data entry, some aspects must be taken to consideration such as:

**Minimize Error Possibilities** [PRESS92]
One of the objectives of a good interface is to prevent that its users commit errors. Well designed interfaces must provide prevention error mechanisms that guide the users to work within any context and make it difficult for the user to do things that are not permissible in that context. Therefore, the user will not choose an invalid option and afterwards receive an error message [FOLE90].

**3.  Methodology Used in the Analysis**

**The Buying Process**
The main purpose of this kind of website is to sell products over the Internet, so the buying process is the most important process on the website itself. The analysis was based on this process because if there is any kind doubt, or mistake in this process, online customers will just click away. Milk was chosen to be the used product on the analysis.

**Methodology**
We first choose some requirements that we judged useful to our analyses.

With the requirements selected, we started to perform our analysis. For this, we used a methodology used already to analyze some commercial sites [DANT01]:

This method was chosen based because of its simplicity. Even thought it is a very simple method. it seemed to be very efficient in reaching its objectives.

We will know give a brief description of our method:

1.  We choose The sites. We decided to analyze the most popular Brazilians supermarkets' site.
2.  We defined the appropriate requirements for the analysis.
3.  We create a table (figure 1) where we could write the requirements and the sites so we could mark if the site has or dos not have the desired characteristic (we used Yes and No)
4.  Every Yes corresponds to one point and every No, zero.
5.  The site with the most amount of points is the one with the best interfaces
6.  A general analysis of each one of the sites

| Requirements | Zona Sul | Pão de Acúcar | Sendas |
|---|---|---|---|
| Always keep the same visual presentation And behavior | YES | YES | YES |
| Always use the same codes | YES | YES | YES |
| Exhibit messages always on the same Logical position | - | - | YES |
| Position menu items always on the same Relative position | YES | YES | YES |
| Show global commands at all times (Example: Close, Help...) | YES | YES | YES |
| Do not use the same icon to represent different Commands | YES | YES | YES |
| Standardize the use of small and big letters | YES | YES | YES |
| Use consistent metaphors | YES | NO | NO |
| Hardware level or lexic feedback | YES | YES | YES |

| Requirements | Zona Sul | Pão de Acúcar | Sendas |
|---|---|---|---|
| Sequence level or synthetic feedback | YES | YES | YES |
| Functional level or semantic feedback | YES | YES | YES |
| Problem Solving | YES | YES | YES |
| Dominating Control | YES | YES | YES |
| If the site has accelerators | NO | YES | NO |
| Interface that can be used by anyone | NO | NO | YES |
| Friendly to the user Interface (A good visual communication) | YES | YES | YES |
| Information in text form | YES | YES | YES |
| Icons that express its objectives | YES | YES | YES |
| Short command names | YES | NO | YES |
| Pull-down menus | YES | YES | NO |
| Follows the *seven plus or minus two* rules? | NO | NO | NO |
| Were they carefully chosen? | YES | YES | YES |
| Menu items that cannot be selected are disabling? | NO | YES | NO |
| Does the site have the commands Abort/ Cancel/ Correct? | NO | NO | NO |
| Were there any doubts while you browed the site? | NO | NO | NO |
| Reduce the number of necessary shown actions And the entered data | YES | YES | NO |
| Consistency between the required information And the entered data | YES | YES | YES |
| Allow the users to customize commands and Messages | YES | NO | NO |
| Allow the users to control the interactive flow | NO | NO | NO |
| Give a *help* option | YES | YES | YES |
| Eliminate redundant inputs | YES | YES | YES |
| **TOTAL POINTS** | **23** | **22** | **21** |

**Table 1**: presence or absence desired requirements.

## 4. Some Detailed Considerations of The Analysis

**Carrefour.com.br**

One of our first observations was that even though, all organizations are aware of the importance of their information systems that deal with day-to-day information be as useable as the ones geared towards wider audiences an that their web pages can position them on a new way of performing business, the Carrefour's site because refused to load every time we tried to analyze it.



**1-** Carrefour's website error.

The website was not analyzed because a problem of browser compatibility occurred. This kind of error could never occur to an B 2 C website.

The error was a Flash Technology error. Many browsers today support this kind of technology, but a lot of then doesn't. By using the Flash Technology to create and maintain the website, Carrefour is losing a lot of potential customers over the Internet.

**Zonasul.com.br**

What was more remarkable point in this site was how colors were used. The interface designer of the site *zonasul.com* carefully choose the colors. We can see that color was used with the purpose of improving communication. But also with the purpose of making the client feel himself at the supermarket, once that the colors used on the website were the same colors used on the physical store.

Another consideration was the feedback zonasul.com's site offer. As someone continue to shop, the total value of the buying chart is presented at the top left corner of the website. Below to this value, the log in and password fields are presented. Also at the left side, there is the Online Help and the search mechanism. Those website functions are very important to the process, so this positioning is very clever.



**2 -** The use of colors and different types of menus on zonasul.com website.

The website has pull-down menus but those menus do not follow the seven plus rule. An important feature is the opportunity to customize the menus by the customer. The user can change menus by just clicking in a button at the top right corner of the menu.



**3** - The option of changing the main menu.

The right side of the pages is used by the company to show adds of special offers and special cooking hints, always using products that are sold by the website.

The visual identity is maintained by the left side menus and the top menus, both are present on all pages throughout the entire website.

The feedbacks are very useful at the website. First of all, menus that have sub menus under the main option have arrows to indicate it. Second, the "alt" technology used, it allows the user to see more details about the product by just passing the mouse over the image.

There is customer's service links at all pages, and these pages – Customer Services – provide information such as email addresses and telephones numbers.

After selecting a genre of products, a list of products is presented. Each line has the product name, photo, price and quantity. There is the possibility of choosing any quantity of each product that the customer desires. It is simple and easy. Items can be added by just changing the number from zero to the desirable quantity, or clicking on the Up arrow at the right of the quantity field. Other function of the list is the option of not having the picture of the product displayed. It makes the website faster and simple.



Each product has a "More Info" button, that once activated, a new windows appears , and specific information about that product is presented.

Once the list of products is done, the costumer can see every item on it. At this point the option of closing the purchase is offered, this action will take him to the next page, where the login process occurs. After that, there is only access to registered users. An important observation is that there were not presented at any page the "Back" button.

**Amelia.com.br**
The first time at amélia.com.Br, the user has to choose between two websites, paodeacucar.com.Br (Online Supermarket) and extra.com.br (Electronics Online).



**4** - The entrance of Amelia.com website

Once at the homepage of paodecaucar.com.br a logon or zip code is required to enter the website. This process is different from the one used on zonasul.com.br where the logon process is required only at the end of the buying process.

After one of those two processes is done, an initial page is loaded.

This is the homepage of paodeacucar.com.br. It contains a lot of information, like banners and propaganda, that are not important to the buying process of the website. It ends up confusing the customer. On the other hand, this is the only website that has the "secure lock" on all of its pages, indicating that the information about theirs customers are taken very seriously.
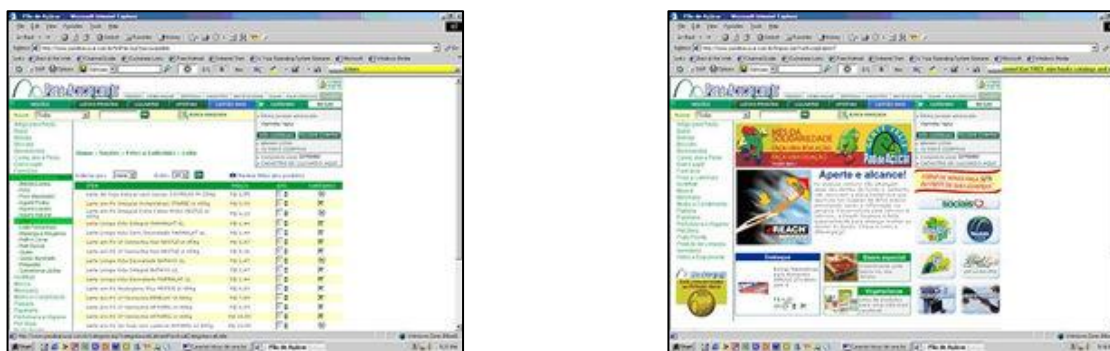
**5** - Examples of feedback

The two examples above show the use of feedback on the main menu. The item that was chosen becomes highlighted, indicating on what section of the website the customers is at that moment.

Contrary to the zonasul.com.br website, this one do not show the list of products with their pictures, there is only a list of products. This list has two colors that are used to simplify the visualization of the products. This feature makes the website faster. Although there is no picture on the list, there is an option of showing then if the customer wants to.

The value of the buying chart, and the option to see what is in the chart are shown on all pages, that makes the buying process a lot easier.

**Sendas.com.br**
Even though not being so elaborated, Sendas´ website offers a friendly environment to its users. The homepage opens a pop-up with an important note that is simple and self-explanatory. It also has a closing option, allowing the user to visualize only the homepage.



**6** - Senda.com Homepage

At the homepage, special offers are highlighted with bigger letters and the color red. This website does not follow the seven-plus-or-minus-two rule either. The menu bar on the right hand corner and on the top of the page remain the same throughout the whole buying process. We also have the option to search for a product by its name or type.

Once a product is selected, it does not stay DESABILITADO and can be selected again. This is the result of a bad feedback to the user.

To select the desired amount, the user must write the number next to the product. This is a different method when compared to Zona Sul and Pão de Açúcar. This is the method that induces the largest amount of mistakes. Still, this was the only website that offered the contact number throughout the buying process.
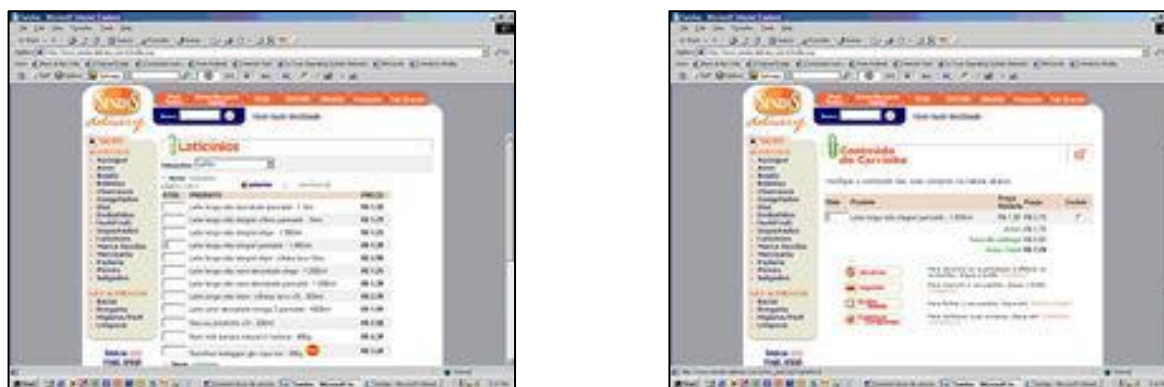
**7** - Sendas list of products and buying chart page.

When the CART option is selected, the users can see the selected products, the purchase value, and the delivery fee. The purchase value is not shown at all times like in Zona Sul and Pão de Açúcar. One unique characteristic is that while visualizing the purchase value, the user can also choose other commands like Print, Close and Continue. The other websites did not show these options.

## 5.   Conclusion

During the interface analysis, the difference between each one of the four websites became very clear. Online sales can be improved depending on the interfaces of the websites´ buying process. Carrefour could not be accessed because the technology that was used required a program that not all browsers have. This causes a terrible impression to the users who hardly will try to buy online at Carrefour again. Nowadays, the harsh competition causes the Supermarkets to avoid as many errors as they can. The users should not have any doubts while accessing the website's pages because the cost that he has to buy at the competitor's website is zero.

None of the analyzed websites followed the seven-plus-or-minus-two rule. The field chosen for the analysis involved a lot of information and the user cannot click around the website too much for he may get lost or end up buying at the competitor. This is why the menus have a large amount of commands and the list of products is visible at all times.

Zona Sul´s website does not offer a Back button, this complicates the user's accessibility for he has to click around all over simply to go back and continue buying. The scroll bar of this website is different from the rest of the website, staying out of pattern and breaking the visual flow. Another characteristic that complicates the user's accessibility is the small font used for all commands and the elderly also have difficulties reading the website.

Pão de Açúcar has a homepage with a lot of information irrelevant for the users. The elderly may also have difficulties understanding what is written for the font is, again, too small. While the homepage should be the most attractive part of the website, it is definitely where the users will get lost. The website has a little amount of icons, a characteristic that interrupts the buying process.

Sendas´ website has a very positive aspect that can also de considered a competitive advantage. The technology used creates a cookie that allows the users to finish buying even after they visited other websites. Even though this is considered a simple website, this was the only one that offered this kind of technology. Still, the website did not offer the products´ pictures and has an "error-like" method where you type in the desired amount of a product.

Also in this website, the purchase value is not visible throughout the buying process. It only becomes visible when you select the "Carrinho" command that leads you to a page where you also have the option to resume the selection of new products, whereas, the other websites do not offer this option.

Zona Sul´s website is more careful with its users, offers more options, and is better looking. One small detail that makes a difference is that when a product is selected, recepies with that product are shown on the right hand corner of the screen.

Sendas´ website is much simpler that the other two and also friendlier to the user. The chosen fonts are big enough so that it can be read by anyone. It also has some special offers that are emphasized by bigger and colorful letters. This was considered the best website for its interfaces, built focused on its users.

The only unique characteristic of this website is the fact that it does not show the purchase value throughout the buying process. This cannot be judged as right or wrong because the target of each Supermarket must be taken in consideration.

Sendas is more traditional and the elderly commonly prefer to buy there. That is why the letters at the website are bigger. On the other hand, Zona Sul and Pão de Açúcar are more targeted on people who do not like to go to the Supermarket and people who do not look so much at the price of the products. The fact that Sendas do not show the purchase value at all times maybe a strategic plan that is careful not to scare the users with the price of the selected products. Instead, they would rather bet on the fact that no user will want to go back to the huge list of products and remove some items due to the fact that the final value of the purchase is too high.

Pão de Açúcar does not offer a Supermarket website. Instead, they offer a lot of propaganda. They have much to improve in all of their interfaces and become friendlier to their users.

In the world of the Internet, you must be updated with the new technologies and online strategies to be able to improve online sales.

## References

[APPL92]- Apple Computer, Inc: "*Macintosh Human Interface Guidelines*" - Addison-Wesly Company - 1992.

[DANT01] – Dantas, A.: "*A Hora da Verdade do Varejo Online*" - Internet Business - A Revista da Nova Economia – pg 35 – Ediouro Publicações 2001.

 [FERR99] - Ferreira, S.B.L.; Carvalho, S.E.R.; Leite, J.C.S.P.; Melo, R.N.: "*Requisitos Não Funcionais para Interfaces com o Usuário - O Uso de Cores*"  Second Workshop Iberoamericano de Ingeniería de Requisitos y Ambientes Software IDEAS'99 Proceedings- 1999

[FERR02] - Ferreira, S.B.L. & Leite, J.C.S.P.: "*Usability Oriented Systems*" – Balas Conference Proceedings – 2002 [FERR02_B]
Ferreira, S.B.L. & Leite, J.C.S.P.: "*Exemplificando Aspectos de Usabilidade em Sistemas de Informação*" – Encontro Nacional dos Programas de Pós Graduação em Administração ENAMPAD Proceedings – 2002.

[FOLE90] - Foley, J. D., Dam, A. V., Feiner, S. K. & Hughes, J. F.: "*Computer Graphics - Principles and Practice*" - Addison - Wesley Publishing Company - 1990.

[JACK94] - Jackson, R., MacDonald L. e Freeman K.: "Computer Generated Color: A Practical Guide to Presentation and Display" - John Wiley & Sons. - 1994

[LEIT95] - Leite, J. C. S. P.: Class notes of the discipline "Requirements Engineering" – Computer Science Department, Catholic University of Rio de Janeiro – 1995

[MARC87] - Marcus, A.: "Color: A Tool for Computer graphics Communication" - Color in Computer Graphics no. 24- SIGGRAPH - 1987

[NORM86] - Norman, D. A. & Draper, S. W.: "*User Centered Design*" – Hillsdale, NJ: Lawrence Erlbaum – 1986

[YESI99] - Yesil, M.: - "Criando a Loja Virtual" – Editora IBPI Press – 1999.

[PRES92] - Pressman, R. S.: "*Software Engineering - A Practitioner's Approach*" - 3rd ed., McGraw-Hill, Inc. - 1992.

[SMIT87_A] - Smith, W.: "Computer Color: Psychophysics, Task Application and Asthetics" - Color in Computer Graphics no. 24- SIGGRAPH - 1987.

[http_1] - MCT - Ministério da Ciência e tecnologia – 5/11/2001
http://www.mct.gov.br/index.asp