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Can Usability Influence the Success of an on-line Shop?

Simone Bacellar Leal Ferreira
Associate Professor, Ibmec-RJ
Av. Rio Branco, 108, 18th. floor, Rio de Janeiro, 20040-001, Brazil
lealferreira@ibmecrj.br

Anna Luisa Bacellar
IBIC Student
Av. Rio Branco, 108, 5th. floor, Rio de Janeiro, 20040-001, Brazil
aninhabace@hotmail.com

Diana Reis Gonçalves
IBMEC – Faculdades Ibmec-RJ - Mestrado e Graduação em Administração
Av. Rio Branco no. 108 18o andar – Centro – Rio de Janeiro – Cep: 20040-001
diana.goncalves@cvrd.com.br

Marie Agnes Chauvel
Associate Professor, Ibmec-RJ
Av. Rio Branco, 108, 5th. floor, Rio de Janeiro, 20040-001, Brazil
mchauvel@ibmecrj.br

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Abstract: “Shoptime”, a company part of “Organizações Globo” created in 1997 and its core business is selling products through TV and magazines. In terms of competitiveness, information is essential to “Shoptime” being a key factor not only in terms of competitiveness but also in terms of public perception. Information permeates this organization in several distinctive ways

The Internet revolution has made this company aware that information is not only important for internal but also for external consumption. With the development of internet innovations, this company perceived a great opportunity to offer convenience for purchasing on-line. So the arrival of “Shoptime” in the internet (shoptime.com) was a natural consequence of this technology tendency.

Information systems are responsible for processing and distributing the information among this organization. Due this information importance, shoptime’s site became essential to the company’s success. Its user interface, part of the system where the dialogue between man and machine is established, became this way an important feature and must really be easy to use, that is, it must be user-friendly, orientated towards usability.

To obtain such interfaces, the designers must take in consideration the non functional requirement (NFR) usability at the system definition. These requirements, related to data input and to visualization of information, may contribute to obtain quality information, correct and not ambiguous.

This paper presents an analytical study of the NFR usability of a commercial site, shoptime.com, and shows how the lack of consideration of these requirements can interfere on a site.

Introduction

"Shoptime", an entrepreneurial company part of "*Organizações Globo*", was created six years ago. In terms of competitiveness, information is for "*Shoptime"* a key factor because its core business is selling products through TV and magazines.

The Internet revolution has made this company aware that information is not only important for internal but also for external consumption. With the development of internet innovations, this company perceived a great opportunity to offer convenience for purchasing on-line. So the arrival of "*Shoptime"* in the internet (*shoptime.com*) was a natural consequence of this technology tendency.

Shoptime.com began to operate in 1997 becoming a new channel to sell. Today it has more than 1.5 million customers and offers more than 2500 products. *Shoptime.com* operates in all Brazilian territory [http_2].

In countries such as Brazil (one of the biggest in the world, 8.547.404 Km ^{2}, with a very diversified culture), such companies are very important; they contribute to eliminate cultural and commercial barriers, shortening distances, renewing economic concepts, creating new professional relationships and job functions [DORN01]. Given this context and in order to be effective, information systems of these companies, such as the organization web sites, should imperatively be easy to use. Only organizations aware of this fact can be successful in communicate, establish and maintain long term and profitable relationships with such a diversified universe of consumers.

Only recently the matter of usability has been perceived as important to information systems professionals. Driven by the market, organizations are putting forward their web pages in order to position themselves on a new way of performing business. Since the technology infrastructure used to construct web sites can deal with images, sounds and nice text composition, it became more evident that the output of information should be treated with care [FERR02_A].

Information system must be designed with the purpose of establishing a productive interaction between the system and their users in order to increase people's productivity while performing their tasks. They must satisfy the expectations and needs of their users. To achieve this end, the NFR (non functional requirement) usability must be present in any method for systems construction.

Due to the great value of information, the user interface becomes an important part of the information systems. It is the visible part of the system and where the dialogue between man and machine is established. Assuring that systems are developed in such a way that the interface with its users is being treated with the due care is only possible if there is a way of guaranteeing that the NFR usability is taken in consideration at the system definition [BIAS94]. Usability is defined by a product being easy and fast to learn, efficient to use, easy to remember, causes no operating errors and offers a high degree of satisfaction to the user, and is able to solve the task it is designed for [FERR02_B], [FERR03].

Failure to take NFRs in consideration has been reported in the literature [BREIT99] [DAVI93], [CYSN99]. In this article it is shown how important it is to considerer them, especially when designing web sites for new entrepreneurial companies, that depend mainly on the ability of their clients to perceive, process and use the information in order to find or discover a product, estimate its value and decide to purchase it.

Since *shoptime.com* is a company whose success relies mainly on clients' perception of the products offered on the site, this paper chose the web site, *shoptime.com* to perform the analysis. The results are presented with the sole intention of showing how important it is to consider NFR as early as possible during the process of system construction. We follow the taxonomy to describe the results of our analysis [FERR02_B], [FERR03]

Usability

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. 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.

Building systems that take in consideration NFRs, require the availability of a corpus of knowledge to help the engineer in the task of defining the system to comply with those requirements. This work is a starting point on the direction of producing a corpus of knowledge on usability in such a way that it could be used in the context of the NFR framework.

Taxonomy

It was developed a taxonomy that putted together using as source the general literature on design and usability and our practical experience with the topic. The usability taxonomy is organized around two main categories [PRES92]: presentation and data entry.

1. Presentation:
Consistency (visual design; use of color; unexpected behavior; icons; icons x functions); feedback; ability level (direct manipulation; essential information); human perception; metaphor; minimize memorization; functional sort; resolution

2. Data Entry
Help (visual features; facilities); minimize error; error recovery (inhibition of items; inform user; minimize input; flexible interaction; customization)

1. Presentation Category

Consistency

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, it 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.

Figure 1 shows some screens of the site shoptime.com. These interfaces present inconsistencies in several of its aspects. Some examples are described below:

A. Visual Design

The screens have different layouts. Figure 1.A shows the page of brinquedos' section (toys). This interface presents message, not presented in the screen of figure 1.B (cama, mesa e banho section (sheets)), informing in which part of the site the user is.

In the section brinquedo, the vertical menu seen in the left side of the interface is called seções (sections); this menu shows many options of toys to the users. This same vertical menu in figure 1.B is called promoção de inverno and has the same function of the menu of figure 1.A, that is, presents options of objects to users. In figure 1.D, this menu has another item, called grandes marcas; and the worst of all, this menu is not even showed in presentes' section (figure 1. C).

B. Proper Use of Color

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 unintelligible 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].

Figure 1.A: vertical menu is called *seções*

Figure 1.B: vertical menu is called *coleção de inverno*

Figure 1.C: vertical menu menu is not even showed in *presentes*' section

Figure 1.D: vertical menu has another item, called *grandes marcas*

The interface designer of the site shoptime.com was not careful choosing the colors. It is visible that color was not used with the purpose of improving communication. Basically all pages are white, orange and blue. Different colors could be used to help users to identify different items (each page related to the sections bebês, brinquedos ,informática … could have been designed with different colors). There is a horizontal bar, with different color and the name of the section in the middle of each page. This different color could be used to indicate the section on the main menu, as it is used in many successful commercial sites, like amazon.com.

People associate colors to diverse situations of their lives. These associations depend on diverse aspects: geographic, cultural, age. Based on this property, colors can be used to help users to navigate among a site. The site shoptime.com was designed without considering these associations. Only on the page Como comprar (how to buy?) colors seem to be used with the purpose of helping users to associate the page with the its objective. This page is red. On the other pages color was used in an arbitrary way.

C. Unexpected Behaviors

Another serious problem on the analyzed site is unexpected behaviors caused by bad design. When the user chooses the option como comprar (how to buy) in the upper horizontal menu, is not opened a page called como comprar, but a page called dúvidas (questions) is opened (figure 2). This may confuse the user because he is probably, and logically, expecting to see a page called como comprar

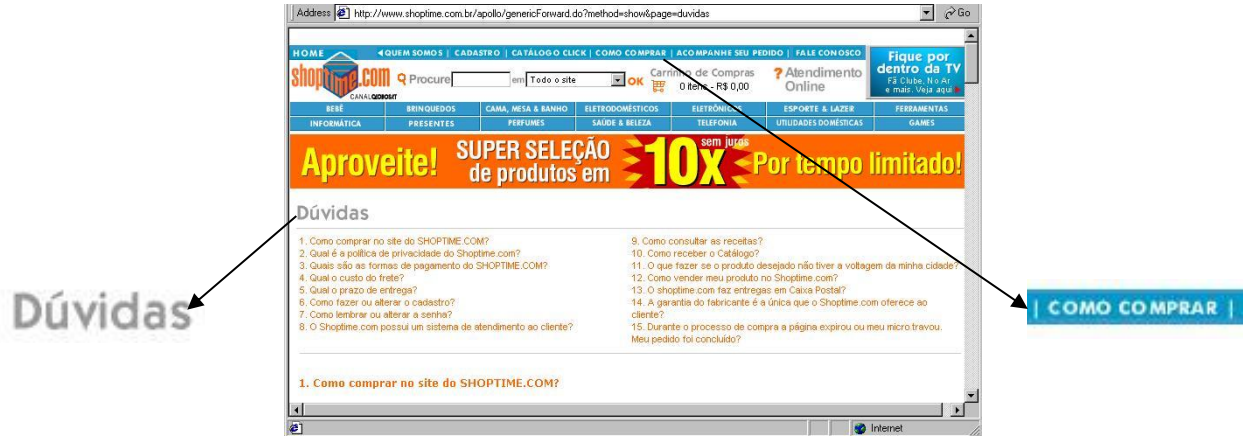

Figure 2: Como comprar page

D. Uses of different icons for the same action

Another serious problem is the use of different icons for the same action. Figure 3 shows the use of two different icons for the buying cart. Even though both icons are very similar, it would be more effective to use only one. This would avoid user´s doubts and facilitate navigation through the site.

Figure 3: The use of different icons for one same action

E. Uses of a same icon for different functions

Using one icon for different functions may disturb the user. Figure 4 shows one same icon, used to continuar (continue), and voltar à loja (back to store). Even though the names of the functions are written inside the icon, this is not a good technique, once an icon, that is, a pictogram that represents an action, should help users to find out the meaning of functions without having to read its label.

Figure 4: One icon used for different functions

Feedback

In any kind of communication, feedback is very important. When two people talk, they are constantly giving each other feedback through gestures, expressions and multiple other signs. In order to obtain a good interaction between person and computer, good feedback must be supplied, however, this must be planned and programmed [FOLE90].

The site studied has some good examples of feedback. Figure 5 shows the use of asterisks to indicate the fields that should be completed by the user.

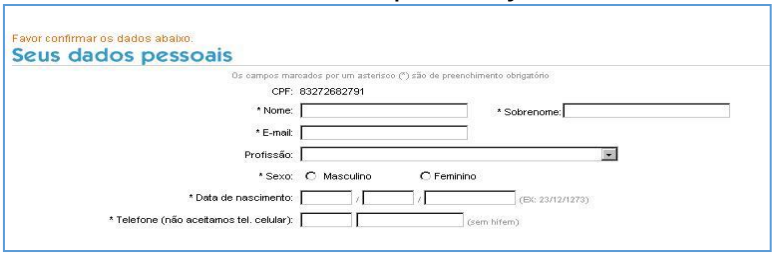

Figure 5: Use of asterisks to inform the users all fields he must fill.

Other good feedbacks provided by the site are the constant exhibition of the amount of items the user is putting in the buying cart (figure 6) and the message indicating to the user that a specific product is sold out (figure 7)

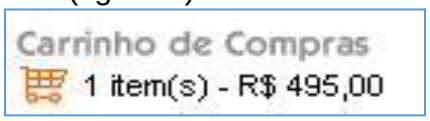

Figure 6: exhibition of the amount of items in the buying cart

Figure 7: Message indicating that a product is sold out

However there are some problems related to the feedback. Some pages of the site present a message to the user informing him/her where he/she is (figure 1.A) but most pages lack on this information (figure 1.B). Without this information, the user must spend some time trying to figure out which part of the site he/she is currently visiting.

Different Ability's Level and Human Behavior

Since an interface must be designed in such a way that it can be used by experienced users and by beginners, it must attend to some requirements.

A. Use of Visual Features

Visual features, such as pictures and icons, are excellent tools for beginners; they help them to visualize its actions better. *Shoptime.com* pages use visual features in a proper manner. An example is the horizontal bar used in each section, where a picture related to the current section can be seen (figure 8).

Figure 8: Picture related to each section

Another visual feature that should be used is the icon; an icon is a pictorial representation of a function, an object, an action, a property or any other concept. Well designed icons can be recognized faster than words; if well chosen, they become independent of language, making possible the use of the interface in several countries without being necessary any translation. The site does not use icons in a proper way and many of them are not well designed.

Well-designed icons should have the following properties:

1. Easy Recognition: how long it takes to a user to find out their meaning. Figure 9 shows easy recognition icons and figure 10 shows icon not easy to recognize.

Figure 9: Easy recognition icons

Figure 10.A - Not easy recognition icons (mail envelope icon)

Figure 10.B - Not easy recognition icons (pencil icon)

Figure 10.A shows an envelope indicating the company's address in case the user want to send a letter using a conventional post office. Figure 10. B shows a pencil indicating that the user can send an e-mail. In fact, these icons should change: the pencil should indicate "write a letter" and the envelop "send an e-mail", once envelopes are already widely used in all popular sites to indicate e-mails. This meaning should not be changed

2. Easy to remember: how long it takes to a user to recall it's meaning once he had already forgotten. Figure 11 shows easy to remember icons and Figure 12 not easy to remember icons.

Figure11: Easy to remember icons

Figure 12: Not easy to remember icons

3. Easy to discriminate: how easy is to an user to discriminate the icon among other icons. Figure 13 shows easy discrimination icons and Figure 14 not easy discrimination icons.

Figure13: Easy discrimination icons

Figure14: Not easy discrimination icons

B Use of Other Facilities

Some features like menus, forms and prompts are great aid to the beginners and are present along the entire site. Since many times advanced users consider these facilities slow, well projected interfaces must also allow the use of *accelerators* such as *function keys and textual commands*, in order to make the interaction faster [FOLE90]. *Shoptime.com* allows the user to navigate using the keyboard.

Human Perception

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 [PRES92]. 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.

Shotime.com has few customization possibilities. It is not possible to change its text size, not even using the browser. This can turn people perception worst, especially older people that need bigger fonts to read.

Metaphors

The designer must take advantage of people's knowledge of the world around them by using metaphors to convey concepts and features of the site; the use of metaphors that involve familiar turns the interaction less hostile and easier [APPL92]. One of the best examples of metaphors used in commercial sites is the shopping cart, used in Shoptime.com.

But Shoptime.com uses metaphors sometimes in a confusing way. As seen in Figure 10.A the envelope and the pencil are using to indicate not really what users associate them with. It would be better to use a pencil indicating the action of "writing" and the envelope the action o "e-mailing". With these examples it is possible to conclude that is not a good idea to modify the meaning of items already standardized. It must be used consistent labels, standardized abbreviations and predicable colors. New representations must only be created if they have still not been standardized; in this in case, arbitrary signs cannot represent them; they must be carefully chosen.

Minimize Memorization

A good interface invokes the user's recognition rather than recall memory whenever possible. Shoptime.com sometimes forces unnecessary memorization. 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 they do not induce doubts [PRES92]. Many examples of use of icons that do not express its objectives had been seen (figures 10, 12 and 14).

Functional Command's Sort

The menu's bars offer many options for the users; 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 people need to deal with amount of items, it is known that they feel more comfortable if the number of items is not greater than seven more or less two, thus, a menu must not have more than seven more or less items. Figure 15 shows a horizontal menu of shoptime.com, where it can be seen that there are many more items than what is recommended. Probably the user would feel more comfortable if only some main options were showed and other items could only be showed as pull-down menus, when the user passes the mouse over the main options. Many options could have been gathered in the same item, reducing the amount of items presented.

This could be proper done if the designer of the site remembered that the word menu is a metaphor with the restaurants' menu. Normally, in a restaurant's menu, the options are grouped together according to the kind of food (sea fruits, meat, pasta … masses etc.). In the same way, in an interface's menu, the options must be grouped following some functional similarity criteria established by the designer.

The options not shown would be presented once the user choose a menu's item; they could be shown as sub-menus below it (pull-down menu or hierarchical menus); in this 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. The same could be applied to the vertical menus in each section (figure 16).

Figure 15: Horizontal Menu

Figure 16: Vertical menu

Direct Manipulation

Direct manipulation makes people believe that they control the objects represented by the computer; an object on the screen must remain visible while the user is performing any action on the object, in this way, the impact of the operation on the object may be immediately perceived by the user. The same way, when the mouse passes over any object that may be manipulated, this must be highlighted. The analyzed site highlights items properly. When the mouse passes over them, they change their visual appearance (like changing color).

Exhibit only the information that is essential to the context

In order to be better assimilated, only the information relevant to the current context or mode must be shown; the user must not have to be looking for many different data to find out what he needs to execute its task. To improve the information quality, it must be used, always that possible, distinct windows to show information of different types and, at least one part of each window must be visible [PRES92].

Shoptime.com's interfaces are poor when dealing with information. As already seen in figure 1, the several site's screens are full of information, pictures, banners … that turns the process of finding something very difficult and boring for the user. Different types of information are showed in the same window. Not even the part called Fique por dentro da TV is showed separately. This part, is related to the television programs, so in fact could be considered apart from the rest of the site, and their content could be shown in different windows.

Resolution-Independent Design

Another issue that must be considered when designing usability-oriented sites is the resolution-independent design. In traditional interfaces, the designer knows for which environment he is designing; he has total control on each pixel of the screen that appears

for the user, and he can be sure how each element will be seen in the screens, independent of the resolution of its monitor.

In Web, the designer has no control on the layout of the interfaces. Once the user can access the Internet in many ways, design for web must adequately be planned. One of the basic principles of constructing resolution-independent sites is to, instead of using fixed sizes to design elements of the interface, one must specify layouts as percentages of the available space [NIEL00]. This really must be considered once many people and organizations still have low-resolution's monitors

Figure 16 shows the site in a low-resolution monitor. It can be seen that its design is not resolution-independent. Important elements disappear (the upper icons…) in these monitors the user now has to use the horizontal scroll bars to see the whole pages.

Figure 17: Shoptime.com showed in a low-resolution monitor

.2 Data Entry

Users spend a lot of time choosing commands, typing data and others inputs. A good interface must minimize the time that the user spends with these tasks. The following guidelines improves the interface's usability when dealing data entry [PRES92]:

Help Facilities

Help must be supplied for every input action. Even thought there is a Customer service page (Figure 2), where the users can find detailed information about many of the site's features and also an on-line 24 hours help, where the user can chat with an user support, the site does not offer tips when a user passes the mouse over the screen's element (tips are showed only over the upper icons). These facilities should have been implemented; they allow the user to find out the utility of many items without going to the customer service.

Minimize Error Possibilities

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]. The site presents some of these mechanisms:

Provide Error Recovery

Experimental evidences show that people are more productive if their mistakes can be readily corrected [FOLE90]. So a well-designed site must provide a good error recovery (undo, cancel, correct …). By providing this error recovery, the user feels more comfortable to explore unlearned facilities without fear of failure. This encourages exploratory learning. Basically there are two types of errors: functional and syntactic.

1. Syntactic errors: occur when commands are typed with wrong parameters or names; in this case, the site must provide a clear message. Figure18 shows a message presented when the user informs a wrong CPF.

Figure 18: Message presented when a syntactic error occurred

2. Functional errors: are the most serious; it occurs the user does a command he didn't mean and unexpected results occur. The studied site presents some error recovery features. An example remove option that appears to allow the user to remove an item he added to the cart (figure 19).

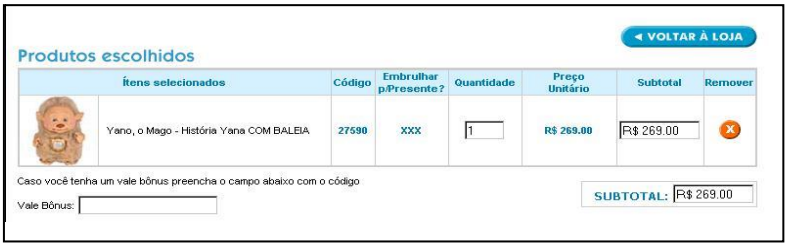

Figure 19: Error recovery

Inhibition of Items not Valid

Items not valid in the current context should be inhibited or disabled. When the shopping cart of a user is empty, the site does not disable this invalid item and does not alert the user by changing the icon's appearance (for instance, changing its color). Instead, the site allows the user to choose the cart icon and only then it alerts the user through a message in a new window (Figure 20).

Figure 20: Empty cart message

Inform How the User Must Input Data Correctly

The user must be informed of how he must fill any field. Shoptime.com guides the user in this task: whenever the minimum or maximum length of characters is limited, at least one number is required, these information is given to the user before he fills the field (figure 5). Figure 21 shows a message presented to the user informing him/her how to add items to the shopping cart.

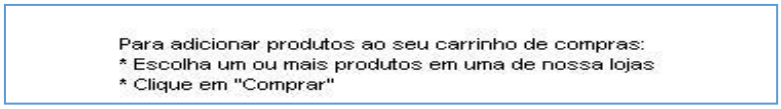

Figure 21: Message informing how too add items to the shopping cart

Minimize the amount of input

A good interface minimizes the number of actions necessary for any input, reducing the task of typing. Shoptime.com provide such facility, for instance, when the user is becoming a registered customer, he needs to fill his address. Once he fills his zip code (cep), the site automatically shows the correct name of his street. The user does not need to fill this field.

Flexible Interaction

A well designed interface must allow the users to control the interactions; he must be able to skip unnecessary actions, to modify the order of the actions and recover errors without leaving the site. Shoptime.com has a problem. When the user tries to become a registered customer, if he already made any shopping using the television, he already is considered a registered customer, even if he did not wanted to. He can not change this option

Customization

A good interface must allow the user to customize its commands and messages. *Shoptime.com* does not allow customizations, not even in the text size.

Conclusions

Only recently the matter of usability has been perceived as important to information systems professionals and organizations aware of the need to design sites easy to use, and of the importance of this issue for successful interaction with consumers. This paper chose the web site, shoptime.com to perform an usability analysis, once the success of this company mainly relies on its ability to establish and maintain optimal communication with its clients. For shoptime.com, it is essential to satisfy clients' expectations and needs, not only with the products offered on the site, but also with the way these are presented and sold, can be find, identified and purchased . The analysis of the site shoptime.com shows several aspects that could be improved in this specific e-commerce information system.

In a competitive market, the NFR usability for e-commerce applications will be of fundamental importance to the success of an enterprise. This means it is necessary to assure that systems are developed in such a way their users' expectations and needs are satisfied. To achieve this end, the NFR (non functional requirement) usability must be present in any method for systems construction. This, in turn, suppose a list of characteristics that should be presented or avoided when building interaction in e-commerce applications and should be dealt with during the definition phase of the information system and not afterwards.

This paper attempted to stress the importance of the NFR usability and contribute by providing a list of characteristics that should be observed in the construction of web-sites.

We also believe that our work is on the direction of building a corpus of knowledge about NFR and to represent that knowledge using the NFR framework [CHUN000]. Once this knowledge is represented as NFR graphs we plan to pursue a conflict analysis of on the usability NFR graph.

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