

# The production of Visual Interfaces for Learning Objects that can be used as educational materials in the Distance Education

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**Abstract.** *This article discusses the basic factors for Learning Objects Visual Interfaces, presented as Distance Education material. The goal is to analyze factors that constrain an adjustment in the developing process and information assimilation by students pointing proposals that will guide the educators and other stakeholders during the distance learning. The method adopted is a literature review that substantiated the discussion of the proposal. It is concluded that the guidelines discussed were satisfactory for the research proposal and may be used for development in other projects.*

**Keywords:** *Distance Education, Learning Objects, Graphic User Interface*

## **1. Introduction**

Distance Education (DE), with the emergence of new information technologies and communication, proposes to overcome obstacles. Thus, exceeding limits of space and time, its goal goes beyond merely teaching instructional. The DE is a possibility of enabling access to knowledge and education. Since the internet has enabled new tools such as teaching methodology, the discussion on the development of Learning Objects with appropriate interfaces for education takes an important position in this scenario.

In DE, the students are also the agents of the teaching process, so it is very important that the materials and the way the content is passed to them is interesting enough to the point that they can interact in this process. However, it is necessary to know how to use the potential that the Internet and multimedia applications offer as media mediators.

## **2. Goal**

The main goal is to provide basic guidelines for developing a graphical interface for learning objects using existing functional models, which indicate how to develop interface and its elements, analyzing aspects that determine an adaptation in the development processes and assimilation of information by the students.

## **3. Methodology**

A literature review on the basic elements used in the production of visual interfaces for learning objects during the second half of 2009 and the first two months of 2010 was used to reach the goals of this research.

## **4. Learning Objects**

There are several definitions of Learning Objects (LA) in the literature because there is no universally accepted definition [2]. The Learning Objects can match any reusable digital resource that supports learning [3]. Therefore,

any support that aims to assist in the teaching and learning that reaches an educational goal is a Learning Object. This research discussed concepts related to the graphical interface of an LA demonstrated through multimedia and Internet applications [3], studied from the trends that suggest standards for: flexibility (re-issue); ease in update, customization (changes in its structure ) technical interoperability (use on any platform), an increase of the value of knowledge and indexing and search (better recovery and ease in searches).

These features are intended to clarify that LOs bring new benefits to education, since "these learning situations represent, if compared to previous school tradition, significant progress in trying to bring knowledge to the 'experiential' reality of the student "[4 ].

## **5. Graphical Interfaces**

The Graphical User Interface (GUI) is responsible for the communication among the student (user) and the application of LA (software). Interface, at its simplest level, is a "software that form the user and computer interaction" [5].

## **6. Development**

The construction of interfaces provides some basic premises that must be performed for proper communication among the means. This research focuses on some topics of development, such as information architecture, screen resolutions, and application layout.

### **6.1 Information Architecture**

Among the theories that deal with Information Architecture, there are two strands [6] the Mental Model, based on cognitive science and the Library Model, adopted in this research, which is guided on the principles of librarianship to index their content according to editorial profile consisting of four pillars: Systems Organization; nomenclature systems, navigation systems and the Auxiliary Systems and Search.

The Planning of a suitable Information Architecture, discusses the pillars with the user's focus, understanding their needs and information seeking behaviors [7] and [8]. Thus, knowing the user is essential to defy organizational structures, classifications, methods of navigation and accessible search engines, moreover, the user has a strength in reading, speed reading on screen is 25% lower than speed reading a paper document [9].

## 6.2 Resolution

The resolutions are responsible for the level of image details. They have some standards and they are controlled by its size (width and height). There are two types of resolutions: the screen (Figure 1) and application (Figure 2).



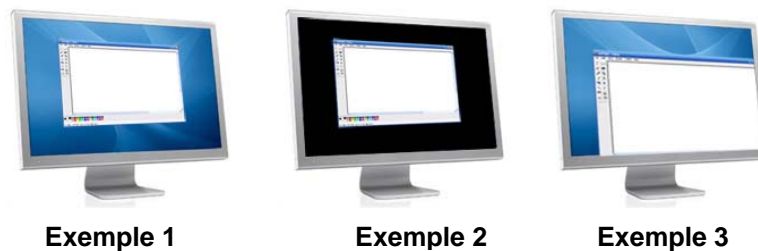
Picture 1: Screen resolution – it shows the screen resolution



Picture 2: Application resolution – it shows the application resolution

### 6.2.1 - Fixed-width

The fixed-width resolution provides a developed and oriented project to work on a specific resolution. When played at different resolutions it maintains its proportion, which can be seen in the examples shown in Picture 3.



Picture 3: The application of fixed resolution played in different screen resolutions.

In example 1 the screen resolution (1024 x 768) is different from the application resolution (800 x 600.) In example 2, the application continues with fixed size, although the application has completed the remainder of the screen resolution with a predetermined color. In example3, the screen resolution (640 x 480) is smaller than the application resolution (800 x 600). This is a critical case because it presents problems for the user, whom has to reposition the application to view the interested area. Chart 1 shows the most commonly used resolutions.

Date	Superior	1024x768	800x600	640x480	Unknown
January 2009	57%	36%	4%	0%	3%
January 2008	38%	48%	8%	0%	6%
January 2007	26%	54%	14%	0%	6%
January 2006	17%	57%	20%	0%	6%
January 2005	12%	53%	30%	0%	5%

Chart 1: Use of resolutions

Source: W3Schools [10]

### 6.2.2 - Liquid-width

The liquid-width resolution, very used in applications related to web, provides a scaling of screen elements. Having a net size application does not mean it is represented correctly in all resolutions.



800 x 600 resolution

1600 x 1050 resolution

Picture 4: Website developed using the net size technique.

### 6.2.3 - Scaled Size

This resolution scales the application to the user's screen resolution. This kind of practice can cause considerable damage to the interface. In general, the application resolution will be "stretched" or "compressed" to fit the user's screen resolution.

### 6.2.4 - Comparison Chart

The chart bellow provides a comparison among layout types:

	Advantages	Disadvantages
<b>Fixed-width</b>	<ul style="list-style-type: none"> <li>- The developer has more control over the placement of content.</li> <li>- It enables planning of blanks (or unused space).</li> <li>- It has narrower blocks of texts to improve legibility.</li> </ul>	<ul style="list-style-type: none"> <li>- They may seem miniature in larger resolutions.</li> <li>- It increases the distance of the user control.</li> </ul>
<b>Liquid-width</b>	<ul style="list-style-type: none"> <li>- Fits a larger number of screen resolutions and devices.</li> <li>- It decreases scrolling.</li> </ul>	<ul style="list-style-type: none"> <li>- Texts with wider dimension are harder to read.</li> <li>- More difficult to be executed successfully.</li> <li>- It can cause lack of blanks (unused spaces)</li> </ul>
<b>Scaled Size</b>	<ul style="list-style-type: none"> <li>- Fits all screen resolutions and devices.</li> <li>- It is a solution for designing applications at younger resolutions or much older resolutions.</li> </ul>	<ul style="list-style-type: none"> <li>- It can warp graphics and texts.</li> <li>- Use extra features of the machine for resizing.</li> </ul>

Chart 2: Comparison chart among layout types

Source: Adapted chart of Fixed- vs. liquid-width layouts - the pros and cons - Beard, 2007.

### 6.3 - Screen size

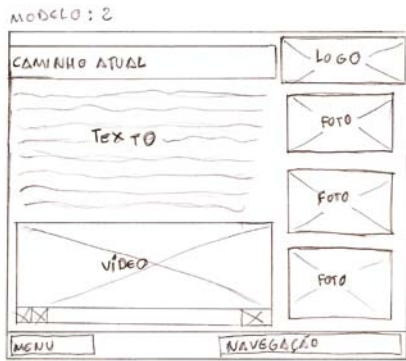
A study conducted in 1997 by the College of Computing - Georgia Institute of Technology indicated that monitors from 17 inches on should be taken as reference in building an application for a varied audience, which would mean an equivalent between the statistical data. With the development of new technologies (LCD, LED) the size of the screens tend to grow exponentially.

### 6.4 - Layout and Diagramming

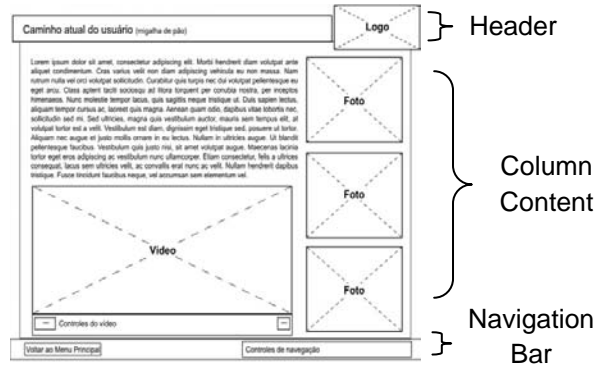
In the design of an interface, the Layout and Diagramming are responsible for visual design. The layout is the art of manipulating the user's attention to a system in order to convey meaning, sequence and interaction points [11]. The diagramming is the appropriateness of visual elements in a particular area of application.

### 6.5 – Wireframe

It consists in a simulation of layout, where the structure and localization of content are shown. It can be used in tests with user to determine if the structure of the application has sense in the perspective of the public that is going to use the tool. The pictures 5, 6 and 7 represent an evolution of a wireframe until its final structure, from paper concept, going through digital model and finally used in the tool.



Picture 5: Scratch in paper of multimedia application wireframe



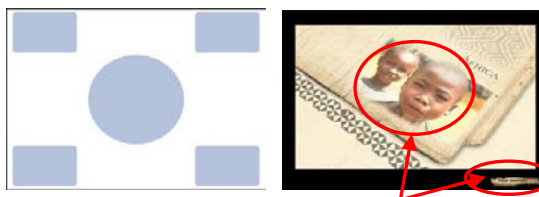
Picture 6: Digital wireframe model



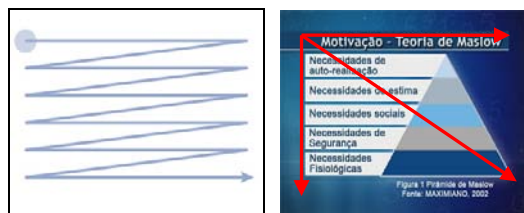
Picture 7: Final result of a multimedia application layout structure

### 6.6 – Influence zones of information

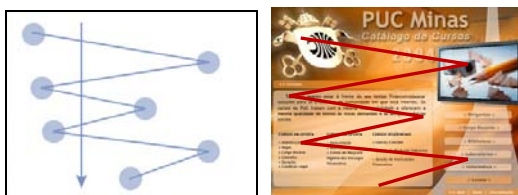
Some techniques were identified for relevant representation of information in the researchers presented in Web Style Guide [12]:



Picture 8: Adaptation of the center and corner model representation  
Source: Middle e Corners - Web Style Guide



Picture 9: Adaptation of the Gutenberg Z model representation  
Source: Gutenberg Z - Web Style Guide



Picture 10: Adaptation of the reading gravity representation  
Source: Reading gravity - Web Style Guide

### 6.7 –Interface elements

The developer must know the interface elements in order to establish patterns of localization according to his priorities guided by the influence zones of information, which are:

**Control elements:** Also known as buttons, menus, navigation bars and icons, they are essential components in any graphical user interface. They establish control over the navigation content.

**Compositional elements:** They are an organization of graphics in order to create meaning, unity and order to the various factors of visual interface, which together gives the effect of attraction, beauty and emotion. The user has to have his sensibility aroused so a visual communication in an interface is essential.



Picture 12: Interface composition elements

**Content elements:** Texts, images, graphics, charts and videos are responsible for the teaching content of learning object.



## 7 - Conclusion

Across multiple knowledge areas, this research proposed to be an elementary guide for the ones wishing to deal with visual interfaces in communication with the students mediated by the internet and multimedia applications. It can be considered as a supporting source of topics for developing other projects.

Searching about "interface design for learning objects in distance education" is not associated to just esthetics, but also to the creation of a learning process that produces knowledge, making proper communication between the transmitter (educator) and the receiver (student), so necessary in distance education.

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