

# THE DESIGN OF MULTIMEDIA DOCUMENTATION SYSTEMS TO TEACH ENGINEERING: A CHANGE OF THE TRADITIONAL TEACHING PROCESS

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**Abstract** *One of the defining principles of the web is that it should provide all people, regardless of physical or technological readiness, with access to information.*

*This principle encouraged us to design hypermedia systems for some subjects of our areas at a Technical School of Computer Science, to try to introduce them to the web as an additional educative resource.*

*The report try to share with other colleagues the steps we followed at the design time focusing not only in technological aspects that made the Web site became a better-looking place but also in other features such as: quality, disabled users, privacy and lawfulness which we were obliged to take into account with the aim of building a robust web-based educational environment to support knowledge-building activities underneath.*

*Index Terms* *design, accesibility, hypermedia, curricula.*

## INTRODUCTION

Multimedia is a term derived from the juxtaposition of the prefix “multi” that means variety, and the latin plural of “medium”, in other words, multimedia is more than one concurrent presentation medium.

The immediate interpretation is easy: multimedia is the way of communication in which more than one kind of information is involved.

Nowadays, the multimedia documentation systems are on the whole, hypermedia systems: it enlarges the notion of hypertext link to include links among any set of multimedia objects, such as sound, motion video, and virtual reality. It can also connote a higher level of user/network interactivity than the interactivity already implicit in hypertext.

The integrated information suite representation in different formats, if it is well-organised, it contributes a lot of advantages which can be useful in several fields such as: managerial world, industry, housekeeping, libraries, museums, cinemas, etc. But it is in education where the use of multimedia documentation systems can probably provide a major novelty and profit.

The huge amount of formative chances is very difficult to sum up, but it is plain that the chance of organising the data in a flexible and useful way has a clear advantage over the traditional formats.

The lack of this kind of environments at colleges is due to the fact that university instructors are often forced to design internet web-sites for classroom use, without the benefit of formal training or an underlying template. This happens because of the bulk of current research focuses exclusively on the technical web implementation issues rather than practical design concerns.

Immediately after, we will describe and discuss some of the costs of using information technology (IT) in education, focusing on those items that are most and least effective in educational delivery and focusin, also, on the decisions educators must make to provide an effective learning environment of this kind as an adjunct to existing lecture-based engineering classes.

## INTERFACE DESIGN

It is very important. The home page tells the user all the contents he can found on the web site about the subject. It must be designed with a little bytes-size, so that it has been quickly to download.

We have come to the conclusion that the designers, in an educational context: the educator or the university staff, they must be carefully not to apply the design criteria, independently, of his audience or his objective as the web site is composed by data and it has been required that it results familiar to the user and easy to use.

In this home page the main web site content is organized and represented in units. So, the user can be guided to other web sites related to the subject, or he/she can be guided by the units across the pages which composed the web site.

These units contain data (*hierarchical information, organized by contents*), always avoiding that the units conduct to an endless list of links among its pages.

On the other hand, not only the web site content does not remain static but also it changes over the time. Then, it has been considered suitable to show the last modification date.

This item is located at the end of the home page so that the user can easily obtain information about the latest version.

Since it is a subject web, oriented mainly to inform, it shows a big textual charge and furthermore, near to the text does not suit to put more images or animations with the aim

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of making it more attractive since the seeked objective is the web site being convincing.

Of course, it has been avoided, endless text pages and schedules with nested high-level

A fast-loading of the page is another important aspect to pay attention.

To organize the data, it has been structured in a hierarchy and the page content balanced, adding them a simple navigation so that it can result straightforward to find the needed information.

Besides, the transactions of extense documents can generate a traffic-jam on the web and the answer time can be reduced.

The consistency among elements has been maintained in all the design features such as titles, heading pages, the navigation way, the colour of the text and links, the shape of images and icons and similar structure to the pages and the typography.

The main purpose managed to it is to give a “corporate identity” at the web site without depending of images and logos . Besides, this consistency makes the creation and maintenance relatively easy.

Do not forget that in all the inside pages, the random navigation are not necessary (the access at any page of the web site from whatever page you chose); not being thus the philosophy followed neither the home page or the home page of each unit which make up the web site.

Alternatively and depending to the in-depth level of the pages, it has been added different kinds of heading pages with its respective navigation elements: links to the previous page, to the following page, and sometimes to the home page if it has seen fit to do it.



FIGURE. 1  
HOMEPAGE EXAMPLE

## WEB SITE DESIGN

To decide the right structure for a web site organizing the data in a collection of pages is very complex and it can be easily influenced by an extensive range of agents: the architecture information which is its main purpose, and its audience among other things.

We have come to the conclusion that the designers, in an educational context: the educator or the university staff, they must be very careful about not to apply the design criteria, independently of his/her audience or his/her objective as the web site is consisted of data and it has been required that it results familiar to the user and easy to use.

We do not want to sell anything so, we try to get a balance between the depth (*the number of clicks*) and the width (*the number of links*). In fact, the logic structure of a web site is, frequently, more useful for the designer but not for the user. Arriving at this point, we have considered interesting to stand out by reason or its quality:

### Data Information Organization

Five steps have been followed at the time of organizing the data:

- splitting the content in logic units,
- establishing a hierarchy among these units,
- making use of this hierarchy to make relations to the units,
- building a web site which remains loyal to the structure of the selected information and,
- analysing the functional character and the aesthetic impression of the web site.

### Web Site Structure

The selected structure of all that Lynch and Horton [1] describe in their book, has been the hierarchical. The reason why we have chosen this kind of structure it is because the user is more familiarized with it, and for a similar reason, it is easier to the designers since they structure instinctively the data by this way.

The features that set apart the web site structure are: flexibility and simplicity. But it has some drawbacks like the confusion since the in-depth level can be endless if we do not decide to mark out soon.

### Web Site Pages Stocktaking

As we can comment previously, the page have been designed following a uniform style and visual coherence. So, the user can quickly familiarize with the environment and he/she is able to know exactly where he/she founds at every moment.

The foundation language of this type of environments is the Html standard. Html is a markup language. Neither it can visualize a page with a fixed size or a text container with a fixed size, too. In other word, the standard Html, practically, can not provide the author any control concerning the format.

Its foremost aim is to describe the information structure of a document, not its appearance.

In a theoretical way, the browsers are the responsible for managing the presentation and composition of the Html pages. According to the current limitations, it is a challenge to us all to have under maximum control the composition of the page elements of our web sites.

Html does not provide tools to directly manipulate objects in two dimensions. It has been necessary in a lot of situations to perform concrete tricks to place the elements in a accurate place inside the page by means of invisible tables, cells of relative width or making use of Web Authoring Tools like DreamWeaver or GoLive which use layout tables as their underlying page formatting device but , sometimes, it is not adequately supported by browser software and it casted aside the accesibility. And even with CSS-styled pages, the user can transform Web content into a format that addresses their requirements for accesibility.

Taking in mind all the above steps, as well as the Html features, we have taken under control some additional aspects:

- the effects can vary depending on the browser used, and also variations that can turn up among the different platforms,
- and in some cases relative measurements has been used, and not the usual fixed in pixels, since the monitor user configuration is unknowledged for the designer and only, by that way, it is possible to adapt better the elements to the different situations.

### **Multimedia Elements**

The graphic design is one of the most important aspects to take into account at the hypermedia system design. Images, sound or video are a big attractive resource, besides they are an important help in the process of comprehension of the represented information. And it is very relevant when talking about the purposes of accesible design focuses on disabled users.

Nevertheless, a good web site needs not only a good quality on the images, video or sound but also a fast-loading. It is very difficult to achieve as the improvement in one of them implies the detriment of the other.

For that reason, we have to find out the compromise between size and quality. For instance, in the graphic files design, we can try out techniques like: compression, dithering or anti-aliasing. The use of some of them merged with the use of the Html labels: <HEIGHT> </HEIGHT> and <WIDTH></WIDTH> contributes to improve the load page rate since the browser knows with precedence the size of the graphic file, it puts aside the respective space, and the text that go with them can download to its final position even before than images have arrived.

And finally and closely connected with multimedia objects, the word copyright. Educators are starting to chafe under the limits imposed by the current copyright policy. That is why you should make every effort to stay legitimate

and include only materials you have the rights to use. If you bear in mind at the design phase, the last results will be better and they will be exclusively yours.

### **THE NEW ROLE OF THE EDUCATOR**

The role of the educator has changed with the appearance of the new paradigm centered in the training period and the trainee, against to the current paradigm (training period versus teaching staff).

Generally, the educator chore has been reduced to transmit and evaluate knowledge. Undoubtely, to make use of the educational technology tools available nowadays can suppose a radical change between the relationship teaching-learning. The educator would must be converted in an information provider, critical analyser of certain knowledge areas, study guide and an inspector of the pupil training.

On the other hand, the pupil would must start to be conscious of his role ,essentially active, in the learning process as member of a virtual community of persons with a educational vested interests.

To be able to define the new role of the teacher, the ISTE (*International Society for Technology in Education*) puts forward a suite of skills of great interest [5], which can be the basis of a learning program oriented to educators.

Of course, to get all these skills to be able to design and develop an hypermedia system of a subject, it is not open to all educators, particularly those of non-technical areas. But only it is difficult because it requires an accurate planning, and an inclination on the part of the educators to be witness of the new purposes, features, and style of this new model of education.

These principles have to lead the activity of the teaching and administrative staff which are part of the institution at the present time.

### **TECHNOLOGY SOLUTIONS**

All the theoretical assumptions described above can we get it with most or least quality with technology underneath.

Of course, it is necessary the assumption of solutions that let the progressive implantation of the new services based on Internet to the university community. Firstly, the subcontracting of the building web site, and secondly, the task related to manage, optimize and support of it requires a high cost and a lack of independence, which sometimes is unbereable to assume.

### **Comparative analysis**

Other options, to use in the design process are due to the use of Web Authoring Tools like Dreamweaver, Page Mill or Microsoft FrontPage to build the web site. However, the chance of offered up-to-date services such as forums,chats, on-line evaluations by means of these tools are still being complicated for both the educators of technical areas and the educators of non-technical areas.

To manage, optimize and maintain the use of expert tools is absolutely necessary. Funnel Web and Watchpoint are examples of this kind of tools.

As an practical example, the results of one of the pilot scheme realized by our team. In that case, we make use of the tool “Funnel Web Profiler” of the Quest Software[4] enterprise to evaluate, manage and maintain the web site of one subject learnt at our Technical School ([http://eupt.unizar.es/assignaturas/itig/arquitectura\\_de\\_computadores/index.shtml](http://eupt.unizar.es/assignaturas/itig/arquitectura_de_computadores/index.shtml)).

After made the evaluation, the tool shows us a set of sorted lashes in which we can read information about: alerts of syntactic problems, usability, compatibility, ill-marked links, inaccessible pages, and an advice as a possible solution to each problem.

This kind of information is very useful overcoat to redesign the web site

On the bad side, our never-ending opponent, the lack of deep technical skills on this matter.

On the other hand, we can choose the acquisition and implantation of proprietary systems oriented to teaching.

On the basis of our personal experience at the University of Zaragoza with the set in motion of the ADD (<http://add.unizar.es>), a teaching digital ring based on WebCT. We come to the conclusion that we must not be closed to the rest of the chances which offers us the technological market , we have to try to find personalized solutions according to each user. As McGreal, Gram and Marks [6] assures the problem would be determined in order to what tools are appropriate to get specified educational objectives.

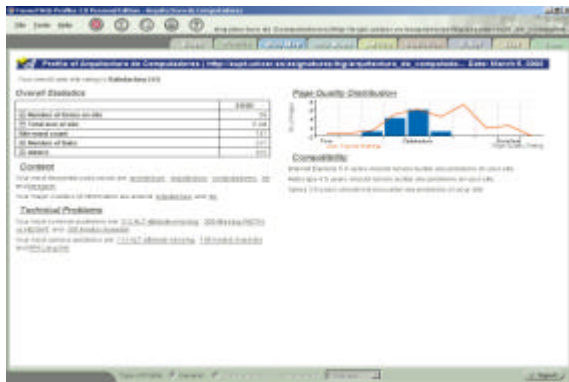


FIGURE. 2  
FUNNEL WEB PROFILE OF A SUBJECT

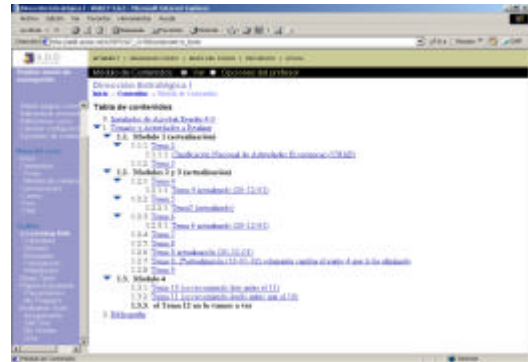


FIGURE. 3  
WEBCT MANAGEMENT SUBJECT INSIDE ADD

### Brief Discussion

This sentence is hearing, frequently, in Spain at conferences: “Certain Web Browser versions does not support Html tags since Html is old-fashioned.

Think for a moment! The real question is: Are they unsupported or are they only marginally supported?

When designers began to use large images, proprietary means, and complex page layouts to produce well-designed documents, the web site came a nice-looking place, but those users who require plain Html for access were kept out from many pages.

We can not forget that World Wide Web is a cognitive medium, so the biggest challenge for web developers (*teachers as well*) is designing pages that supports the needs of disabled users. Around the world, initiatives are under way to develop accesible design guidelines such as Web Accessibility Initiative of the WWW Consortium[7] and in the United States, the amendments to Section 508 of the Rehabilitation Act of 1973.

It is a good practice to follow these guidelines regardless both Acommodate Assistive Technologies and browsers will certainly make use of the information in a near future.

To provide alternatives for many disabilities the educational multimedia as an element built-in your web site is very important. For instance, deaf or hearing-impaired users, benefit from captions with video content.

But materials which are on the web then it is all up for grabs. What a fright!

There is a common misunderstanding as you can make something visible but only to a specific audience. So the designer may consider it , he/she may evaluate the different methods and he/she tries to do the best for him/her and his/her institution.

A case in point, the figure 4 shows us all the public information about the subject Database II. You can see all the units web site , you can move through it and you can take stock of the subject. But when you try to download information in detail of a concrete matter, the hypermedia system forces you to introduce a

login and a password. It is a simple and quick solution, in case you have not a Extranet/Intranet Platform inside your institution. A normal situation at Spanish Universities, when talking about to introduce distance learning at public teaching.

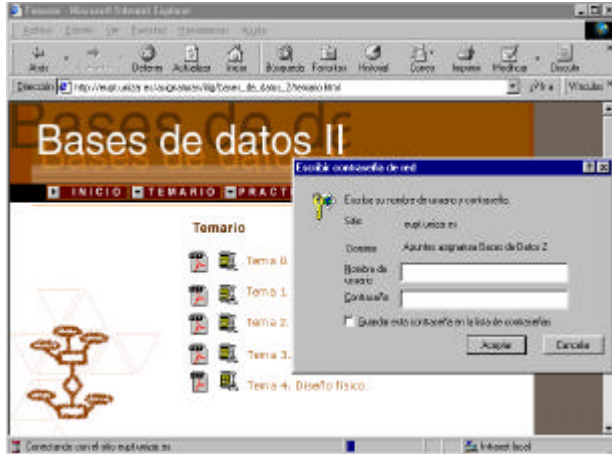


FIGURE. 4  
AN EXAMPLE OF A SUBJECT AUTHENTICATION

## CONCLUSIONS

This report describes the design process and those elements of the environment that are most or least effective in educational delivery, particularly with regard to using hypermedia systems as an adjunct to existing lecture-based engineering lectures.

Often, we forget the need of fully integration of multimedia documentation systems on academic computer science curricula. Not only as a tool or an educative resource, but also as an important factor to take into account in the planning and development of new curricula strategies.

We have to fight against technophobia and skepticism who still standing in our educative centers, and to try to among all to help the education on the way to cyberspace.

Our modest goal is to show the introduction of all these new information organization concepts, and its different design paths focused on the development of a robust web-based educational environment against any kind of frontiers.

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