From E-Learning to T-Learning

F. Colace, M. De Santo, P. Rocca Comite Mascambruno
DIIIE-Università degli Studi di Salerno
Via Ponte Don Melillo, 1 84084 Fisciano(Sa)
E-mail: {fcolace, desanto, procca}@unisa.it

Abstract - Nowadays the E-Learning approach can be considered an effective answer to the continuous demand of life long learning. Thanks to the Information Communication Technologies progress a new approach can be considered: the T-Learning (Television Learning). In fact the spreading of the Interactive Television (ITV) and the new generation of Set Top Box allow the extension of E-Learning approach to the television medium. So in this paper we propose the design and the implementation of a framework for T-Learning. The design of the T-Learning platform has been carried out keeping in mind the IEEE LTSA model for E-Learning platform and the guidelines of Multimedia Home Platform (MHP) and of the Digital Video Broadcasting (DVB) for the development of applications and contents for the Interactive Television. The aim of the proposed architecture is to manage the courses and the activities of a University. In particular we designed the architecture both of the server and client side and the structure of the various educative channels. We designed also “a not content related” channel in order to offer to the students various services for the management of their educational careers (for example the booking exam service). Our system offers also a service for the on-line assessment. The design of the graphic user interfaces and of the contents has been developed according to the usability and accessibility guidelines. In this paper we show also the first prototype of our platform and the first results of its use.

Index Terms – E-Learning, T-Learning, Edutainment, Accessibility, Usability

INTRODUCTION

Aims of this paper was concerned on the analysis of adoptable methodologies, on the identification of reference requirement and on the successive implementation of a web-based platform for the University of Salerno, adaptable to the transmission and using on DTT (Digital Terrestrial Television). The environment was realized in compliance with the usability and accessibility international standards and has held account of web and interface characteristics of adopted transmission medium [1]. Into the chain of DTT our framework was placed across content projecting area and service providing area. In fact, the search has concentrated on interaction modalities for service demand or its associated information.

Constraints for entire project are:

- The enforced norm in matter of usability and accessibility for the applications to computer science as support for Public Administration
- Economization of development and customers using environments
- Opportunity of re-using for patrimony of the already present contents to the inside of the web pages of site of athenaeum.
- Modularity of the implemented platform.

These requirements, in fact, concur, in terms of an effective phase of experimentation of the environment, to extend the functionalities to the entire web University Portal, without that this involves the necessity of one meaningful redesign of the environment. As designed, moreover, environment introduces characteristics of high modularity and adaptability, to guarantee the functionality of the service already from first phases. The paper has the following organization: first of all we will describe the main critical states in the design of a framework for T-Learning. After we will describe in details the organization of the proposed framework.

CRITICAL STATES IN THE DESIGN OF A T-LEARNING ENVIRONMENT

Into designing, the necessity to carry out an opportune transposition of the contents from web to the DTT and the identification of adoptable methodologies in order to proceed in such sense, have implied a series of considerations and analysis, useful to redefine of the target, the contents, the architecture of the information, the scenes of use and requirement. Particular interest has aroused the DTT
customer’s typical attitude and the particular approach in relation to the two different instruments (Web and DTT).

**Figure 2: Example of Remote Control for DTT System**

In particular we have considered two critical aspects related to the transposition of web on the digital television. By first the user can use only remote control buttons as object to interact with DTT pages. It introduces only four different colour push-buttons concuring to approach the informative contents on navigated pages. Such characteristic places ties meant to you approximately the number of steps necessary to approach the present informative content in a specific section. By second the demanded content (a film, rather than a series of images or other) must be used in the same one directly be shielded of the television set from which, at the same time they must continue to be accessible by navigation menu. That determines one meaningful reduction of the portion of useful screen to the viewing of the information.

**Navigation Bar**

All the web content on university web pages has been modelled on the base of the four push-buttons colours available on the remote control of the decoder. The number of the sections was reduced for every area until fours (the number of the push-buttons) and every section maintains always chromatic reference to the colour of the specific push-button of the remote control. We have choice not to conform four push-buttons actions in all the sections being avoided to associate to every one of them always the same page. On alternative chose we have associated to one of the push-buttons the opening of a window on the screen which to be annoying with it. Into this windows directional push-buttons affixed to move in the appropriate web site navigation tree (top and down of the menu) and to the fourth push-button is associated the function of selection of the evidenced voice. Such chosen it has guaranteed three turns out:

- The customer can, anytime, to know the own position to the inside of the navigation tree and to be annoying in it without some tie of fundamental steps. One moves with directional keys and may choose specific section to which approaching. Moreover the same technique is adopted in order to resolve the backwards tree conserving always visible the “up menu” and “main menu” labels.
- On first window any references are present to the voices of menus not active in the specific section (following the model of the main currently present applications on the DTT). In them, because difficulties of the limited space and of the navigation, the contemporary presence for more voices than menu pertaining to hierarchically various levels are limited.
- The designing attention on planning of the navigation menu was directed to the choice of adequate and autoesplicative labels, clearly indicated ones and in every chosen page. The others three push-buttons of the remote control have not been more associate to pages or specific sections, but to the actions (select, magnify, etc.)

**The Video Frame**

The need to maintain visibility on the functions associated to the push-buttons of navigation and to the context in which the information are being moved determines the drastic reduction of the percentage of the useful screen useful to the real distribution of the body of the information. Therefore a redesign of the coming from informative content from the web determines necessity to operate with an optimization of the useful windows for videos transmission and the contents the audiovisual aids in kind. Enough, in fact, not to scale the images to the dimensions really available. With such operation, in fact, it would be gone to compromise determining way to understand of the visual content being rendered of the perception difficult. Our project, therefore, has identified two visualization ways for the videos, respective “whole window” and “reduced window”. A switch between such versions is concurred, therefore like for the text menu, using the directional push-buttons up and down of the remote control.

“Reduced window” visualization does not consist a scaling of the entire video, but in one crop of real interest area in the viewing of the video. In particular, in the case of the projection of a video lesson, it is necessary to visualize the subject to all screen with blackboard for the visualization to “whole window” and only face or only the blackboard (with the outside field voice) in the case of “reduced window”. By designing the environment a similar approach has determined the necessity to carry out one series of careful observations on the perceptive modalities of the customer in the observation of the visualization to all screen. Great importance in the analysis, has been lent to the document of the 2003 from English PJC Associates upon request of the European Commission. Two different analysis ways have been adopted.

- On first, with of the movement sensors, on the base of a champion generically constituted of 100 customers, they have been evidenced sensitive areas of the full image and it has been provided to carry out a cut of the same ones to leave from the original video. We have also considered the recent conception of the t-learning and the fact that the studies and experiments to it pedagogical realizes on these areas are still initial.
- On second we have proceeded to the study of the customer’s behaviour in presence of one reduced surface useful to view a video of greater dimensions. Users were being equipped with a mouse for windows adaptation and to make a choice of the frame to visualize.
Also in this case a heterogeneous generic champion of 100 customers was used. Collected dates were been object of ulterior analysis statistics. The comforting aspect of the analysis has been the clean superimposition of the conclusions caught up with both the analysis modalities. This about relieving the choices adopted to goes them of the same analyses for the distribution of the contents. An interesting consideration, to goes them of the carried out study inside in design. Often also in all in the case of the e-learning, projects contain a big garbage in terms of real communicative usefulness, in the sense that great part of the video effectively distributed, in terms of sizes, could calmly be eliminated. Such operation of cropping would concur greater slimness of the multimedia contents and a faster distribution of the same ones.

**TEXT FORMS**

Limited number of useful keys of the remote control for the DTT cause difficult on insertion of text inside fields to compile on the television screen. In the case of young customers, the insertion of the text through remote control has not involved particular problems. All the interviewed ones, in fact, have associated the use of the alphanumeric keys of the remote control to those of the cellular one. Also the less expert customers have characterized the modality of insertion of the text with the same speed of the experts, in how much, probably for the young age, had a great usefulness of use with the cellular telephones. But is however valid which using the push-buttons of the remote control, above all for the insertion of repeated witnesses and of more or less variable length, it slows down than much the viewing of the contents and introduces a lowering of the level of satisfaction of the customer. On these considerations, we have adopted a meaningful reduction of all the editable fields from part of the customer, limiting some the compilation to leave from the selection of inner pre-digitate voices to menu reduction. Server side of the application design has determined a careful planning of the bases of data and a dimensioning of the same profits to contain a meaningful size of information and continues approached contemporary tables every time that loads one single page to visualize. Moreover, a great size of information must be available preventively regarding the effective distribution of the informative contents. On first we refer to relative users’ identifying information and keys of relations between tables so as to optimize the number of visualizing information for accessing customer on specific page or on visualized object. But these characteristics are still general and independent from the specific modality of adopted distribution (E or T learning). What becomes peculiar, instead, to the inside of a specific plan for t-learning is the organization of the menu and reduction for the compilation of the fields. The reduced available surface, above all in contemporary to the distribution of the video, obligates to identify abbreviated labels for visualization of any voice of the menu and the possibility to approach, after to have selected one reduced voice of the menu, of the complete preview of the single selected one.

In the within of the planning of the graphical interface we have kept account of the adopted communicative choice to recall the function of the push-button of the remote control with the colours from adopted it, also on the television screen. Therefore all the actions associated to a push-button of the remote control will bring back the same colours of the push-buttons associate to them. For the rest of the situated one they have become minimal, and in some case quite nonexistent the frames of the objects in order to maximize the useful space for informative and content menu. Particular attention has been adopted to uses of formatting normal characters set. For particularly elevates size, always in order to maximize visualization any format light character sets are used. For fonts colours, to the aim to distinguish them always in every context and in order to guarantee opportune viewing in all chromium environments over the colours set of the push-buttons remote control single black and white colours were used.

**USABILITY**

In agreement to all the prescription normative enforced in Italy (Law n. 4/2004 on accessibility) and to the prescription of the W3C in way of usability [2] and accessibility it has been provided to realize all the informative contents and interfaces maximizing usefulness by all the subjects with partial abilities of physical type, than cognitive and technological. Out from the aspects legacies to the disability and the communication and the used hardware and informative schemas every modules were designed and optimized in order to answer to three requirement prince of the quality of the communication and therefore of the usability: efficiency, effectiveness, satisfaction

- Therefore as defined from the ISO the effectiveness it represents the degree of attainment of an objective. The measure of the effectiveness places in relation objects to it is prefixed with the accuracy and thoroughness of turns out to you caught up. The organization of the contents informed about the entire portal for DTT of the Athenaeum of Salerno has inspired to this principle focusing the attention on the user and the answer to its perceived requirements. In particular the organization of the information has held account of the typical questions of searched the same customer and of it answered more. The same organization in sections does not hold account of the organizational structure of the same Athenaeum and its hierarchical ordering. In the case of the offices trained to you, as an example, it has not been provided to list of the denomination, the typologies, localization and the responsible. On the contrary they are groups the offices to you for functions for the customer and target to which they refer. A series of questions of the type has been introduced "All the steps in order to enrol me to a Course of Bachelor” and has been introduced the several actions to complete indicating for any of them to the specific office for the development of the same one. The
student is not held to knowing that in order to have use of a scholarship to the foreign country Erasmus a type or international relation must address to office of. On the contrary it will be the same web portal to indicate the student that in order to pick that type of opportunity he will have to address to this office rather than to another.

From ISO definition the measure of the efficiency is always based on the relationship between the level of effectiveness and their resources, that it can be measured, as an example, in terms of number of errors that the customer completes before completing a task, or in terms of time employed in order to catch up just the scope. A task can be defined also like the amount of the effort to employ in order to carry to end. The adopted modality in order to answer to this specific requirement has been considered assuming to make available in the maximum number of five passes to all the present information in the entire web portal. The little performance characteristics of adopted television means are arranged in effective way with politics of planning of contained from the low cargo, extremely light in consultation and streaming on Digital TV

- Finally the measure of the satisfaction describes the perceived usefulness of the entire system from part of the own customers, and the level of comfort perceived from the customer in using a determined product. Draft of an aspect of the more subjective usability much and difficult one to be moderate itself, regarding the parameters of efficiency and effectiveness. But, in this case the more important parameter can be considered. In fact, in a generalized manner, it is possible to assert that the measure of the satisfaction becomes a decisive factor for those products whose use is voluntary. And the television set, even if digital them re-enters totally in this category.

Any pages of the objects introduce an implemented mechanism of rating that voting from part of the customer’s associates one. Such voting happens by means of the only interactive instrument, that one of the remote control and is such that it turns out to you, publics are visible for the customers. On this way they can approach also a section of the entire dynamics web portal, of the type "more voted". Any aspects that in particular have been searched and guaranteed are clarity, free choosing ability, concision, coherence, and recognition, reading and understanding facilities. These factors regard the way in which the information must be introduced and represent the static aspect, outer, graphical, of the interface. Always from definition ISO other aspects are adequacy to the task, car-description, controllability, conformity to the expectations of the customer, tolerance of the error, possibility of personalizing, and adequacy to the learning. These ulterior factors concern the side more cognitive areas of the interaction customer - interface.

**ASSESSMENTS TOOL**

The first one of the two modules implemented into DTT channel is a platform for the distribution experiences of the lessons and the present examinations in the within of university course of studies of the curriculum of languages and foreign literatures.

![Figure 3: The T-Learning Environment](image)

On the basis of the indications presented in the previous sections it has been provided to realize the 18 lessons of the entire course using four typologies of objects from interface:

- Video of the lesson: The video of any lesson is cut for the two modalities to entire and resized screen according to standards presented in previous paragraphs. In order to add a freedom degree to the customer it has been realized also the English version of any visualization of the video ones.
- Diagrams and pantries: by means of the customary directory planned with levels of successive detail they come introduces the contents and supports added for any lesson. Any contents were realized and optimized for the opportune window of consultation.
- The text in order not hearing people: reading in contemporary to the video that is casting.
- Quiz or the relative practices to the lesson in object that contemporary to the video that is casting.

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• Structure design for questionnaire through the acquaintance dominion definition and for arguments concerning to it
• Introduction of services for the generation of report for the teacher and the student in a position to putting in evidence the courses of the examinations or the single customer
• Introduction of services for the management of the database of the questions
• Introduction of services for the personalized verification, in a position to offering to the student questions whose degree of difficulty can have varied so as to allow the student, also in independent way, to appreciate its degree better than preparation.

A T-EDUTAINMENT: KNOWLEDGING UNISA

The other developed and distributed experimental module is an interactive multimedia video game entirely planned for DTT. The video game introduces which scene the university campus of Fisciano and every level of difficulty is represented from the typology of ended action to complete in the same University. Scope of the design, through the game, is to distribute a formative distance and valid answers on the operation of the university of Salerno, on its works organization and logistic, on the didactic offer and the functionalities and accessories offers services. Particular interest arouses the organization of the scenes in the within of the guideline in entrance for students and about publicity of the formative offer of the Athenaeum. The first level of the game is represented from the choice of the university course between those of the formative offer. The diagram winning, all centralized on the real professional outlets offers from every course, I found myself on a series of scenes of the animated cardboard finished one chosen to operate itself from part of the customer. The same customer, in according to level must, by means of one risen of hunting to the treasure, to visit all the main buildings of the entire Campus and to know of the offices, the contained classrooms and the associated specific functionality to everyone of these environments. Actions supplied from the remote control are limited to the choice to continue along a distance rather than other, to eventually visualize the distance already carried out and the attributes or the objects harvests, to visit combinations of always various distances. The game so designed is useful also for students and dependents to acquaintance of the Athenaeum, of the structures but that they mean to expose itself to the acquaintance of the necessary steps to the accomplishment of a variety of actions. Everyone of the levels succeeded game contemplates the variety of actions and offices to contact and practical to act for the attainment of a specific objective. As an example after the choice of the specific course of Bachelor it comes demanded to carry out all practical correctly the necessary ones to the registration. Every present office to the inside of a mansion, goes caught up approaching the door of a mansion carrying with if the necessary documents, otherwise are exited from the mansion and must get in the just places all documents. The possible actions for a player are the same objects of the module for the examinations in how much, approaching a determined office, will be possible to approach to a video, a text, both or ulterior useful objects. To the overcoming of every level of the game series of quiz to multiple answers in order estimating the acquaintance of the effectively acquired elements come proposals one. To the overcoming also of the test it will only be possible to approach the next level.

TECHNOLOGICAL ISSUES

For that care the server side it is developed under technology Tomcat and MySQL. The side client of the application, on the contrary, is developed only through uses it of technology of type Open Source that of it guarantee the portability. The general framework used for creation of the web pages is Struts. The customers environment interfaces were been planned holding on account of the principles of usability and accessibility. The focal point of project and its adopted solutions are represented from the extreme scalability and various adaptability to customers’ volumes and truths also much regarding a university campus. In particular all drained formation environments in kind, continue, working or classical at school formation are adaptable for our environment and suggest a possible application in particular thematic DTT channels. The examinations module introduces the possibility to distribute whichever nature contained formats and adaptable to a variable number of lessons. The environment of interactive game, instead, concurs to know any specific referring truth by means of typical instrument of the animated television toons and of the interaction with it.

CONCLUSIONS

Holding account of the completed analyses, we have developed two prototypal interface modules for the application on DTT. The structuring of the modules and the navigation menu follow the model of the main currently present applications on the digital TV, in which, causes of limited space and navigation difficulties, is stretched to reduce the presence of more contemporary menu voices pertaining to hierarchically various levels.

The basic aspects and conclusion regarding our project are:
• Total correspondence of the contents of the interfaces with prescription of the Law n. the 4/2004 in matter of accessibility and to all recommendations of the W3C in usability and accessibility matter
• Optimization of the surface available for distribution of the contents and navigation menu
• Accordance between colours of the push-buttons of the remote control and the sections tied to the specific action to they associated
• Management of the selection menu in hierarchical way so as to explode of only the sections of real interest
• Reduction of the interactive forms wherever possible, and limiting them for the selection of voices precompiled
• Association of the text insertion to the modality of writing associated to the numerical keys typical of SMS phone
• Reorganization of the video contents not centralized on scaling all the content but on the visualization of the single surface of useful video to one effective perception
• Fruition of all audio contents also in modality single text and subtitled for not hearing people.

REFERENCES