WEB BASED EDUCATION APPLICATION FOR RESIDENTS OF TRADITIONAL MOUNTAINOUS AND FARAWAY REGIONS

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Abstract

Nowadays, the use of Web based Education (WbE) in distance learning education is considered to be an innovative method of learning. Supportive parties argue that WbE renews the educational practice through the use of computers and their applied methodology, as well as the technologies provided by the use of the internet. These result to consciously renewing the educational material and to creating a flexible structure which promotes the individualization of learning.

In this paper, it is presented an educational model of Web based Education (WbE) for the creation of enterprises in the Internet from residents of traditional mountainous or faraway regions (islands etc.). The aim of the proposed model is the learning of basic principles of business administration, PC and Internet use as well as the methodology of design and development of e-commerce acts.

Key words*: e-learning, e-commerce, Web based Education, mountainous and faraway regions.*

Introduction

Electronic learning (e-learning) takes place when between educator and educated, a big natural distance or natural difficulties are interfered which limit the face-to-face communication and consequently technological means are used (sound, picture, data etc.) for the cover of educational void. On other hands, the Web based Education (WbE) provides new opportunities for teaching and learning and a sufficient variety of digital based means for both trainees and instructors. In WbE platforms, trainees must be at the centre of their own learning (trainee based learning) and these systems must be well designed to facilitate learning process. WbE offers new educational environments, where anyone can learn anytime anyplace and get quality education. In WbE the instruction could be either "synchronous", meaning that the communication between instructor and learner is simultaneous, or "asynchronous" which means that the learner is able to interact at any time, without instructor's presence. The WbE instruction could also be based on a mixture of the above two modes (Papachristos et al., 2010a).

The proposed model of Web based Learning *concerns the education with the method of self-learning (self-paced) with monitoring and asynchronous collaboration* where the candidates educated are provided the possibility of working with the material to learn in their personal space having at the same time complete capability of asynchronous communication and exchange of opinions with others co-educated or with the instructor (e-mail, newsgroup etc). The educational

material (material of presentations, case study, exercises etc) will be adapted in the level of the trainee (Fry, 2001, Henry, 2001, Hooley, 2000, Lytras, 2002).

The object of education is the acquisition of special knowledge and skills for their application in the creation of enterprises in the internet directed in the local production and market (e-commerce). This will concern either Business-To-Business (B2B) or Business-To-Consumer (B2C) (Turban et al, 2000, Turban et al, 2004). The first type is used for electronic supplies and enterprising transactions and offers (Doukidis et al., 2001, Turban et al., 2000, Kosiur, 1997, Elsenpeter and Velte, 2001): *decrease of cost, improvement of functional effectiveness, increase of income, supply of services that modernise and organise common work*. The second type is used for the sale of goods and services in customers and offers (Pomportsis et al., 2002, Turban et al, 2000, Doukidis et al., 2001, Kosiur, 1997, Elsenpeter and Velte, 2001): benefit of services and products in cheaper prices, continuous operation, search of more information more easily, possibility for self-service with minimization of cost for call centers. E-commerce changes the enterprising models, reverses the rules and their conventional laws of enterprising activity in profit of "*businessmen*" that live in removed and mountainous regions without being forced to relocate in the urban centres intensifying the desolation of the countryside. Also with the use of new technologies (information technology, internet etc.) important profits can be achieved allocating products in much lower prices. In this case income sources may be created from the support, the advertisement etc (Kosiur, 1997, Turban et al., 2000, Doukidis et al., 2001, Pomportsis et al., 2002).

Review

The utilization of the Information and Communication Technologies (ICT) expands the horizons in didactics and at the same time enriches the Educational Sciences with new more powerful learning tools. There are many educational models-theories of tutoring and learning. Among them are the following (Anderson et al., 1996, Cobb, Wood and Yakel, 1990, Perkins, 1992, Raptis and Rapti, 2002, Retalis et al., 2005, Tennant, 1997, Von Glaserfeld, 1989, Wertsch, 1985):

- *Behaviorist.* Is based on the idea that learning is a form of observable behavior and the result of a stimulant reaction (*Stimuli→Response*).
- *Cognitive approach*. Is based on the idea that in the basic relationship of the previous models enters the term "learner" and as a result comes the new relation: *Stimuli→Learning→Response*. The central poles of this approach are the attention focus, the information processing, the codification, the storage and retraction of information.
- *Constructivism*. In that model, the learner must have or obtain the ability to manage the learning process. Thus, learning is guided and evolved via social interaction accomplished during learning, as the teacher creates and uses the knowledge resulting from actions adapted to the course content.
- *Models of situated learning and communities of practice*. In the model of the situated learning it is necessary to place and communicate knowledge in genuine environments-frameworks that is to say in frameworks that include knowledge within experiential conditions. Also, it is considered that new knowledge and learning is inside the communities of practice and demands social reaction and team work. However in the models of situated learning one can find valuable ideas on new pedagogical practices such as: learning is realized through interactions between people and the living experience, educators constantly offer new opportunities to the students, so as to be participants of communities of practice inside and outside class and form a close relation between knowledge and action.

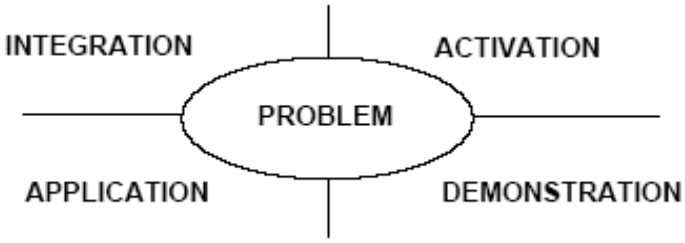
Comparing modern pedagogic models in a Merrill study (2002), the result is that the most

drastic learning environments are those focusing on the solving of problems (problem – centered) and that there are distinctive stages of learning. Furthermore in Merrill's «*Basic Tutoring Principles*», learning is promoted when (Fig.1):

- The students are engaged with resolving of real problems.
- The precedent experience-knowledge of the student is activated and used as a basis of new knowledge.
- New knowledge, skill, is presented to the student.
- The new knowledge, skill, is applied to the student.
- The acquired knowledge and skills are embodied on the learning world of the student.

It is important to indicate that in Merrill's analysis the dominant role has the student's personality and not his participation in an educational group.

Figure 1. Basic Principles of Teaching



It should be notice that in the Merrill's analysis that the educated has a sovereign role as an individual and not his attendance in an educational set.

Today, in the didactic systems design and development it is widely used a non linear model greatly based on constructivism (Blumer, 1969, Kuhn, 1996, Piaget, 1970, Von Glaserfeld, 1989, Vygotsky, 1978). That didactic systems development model, among other things, stands for the following (Retalis, et al., 2005):

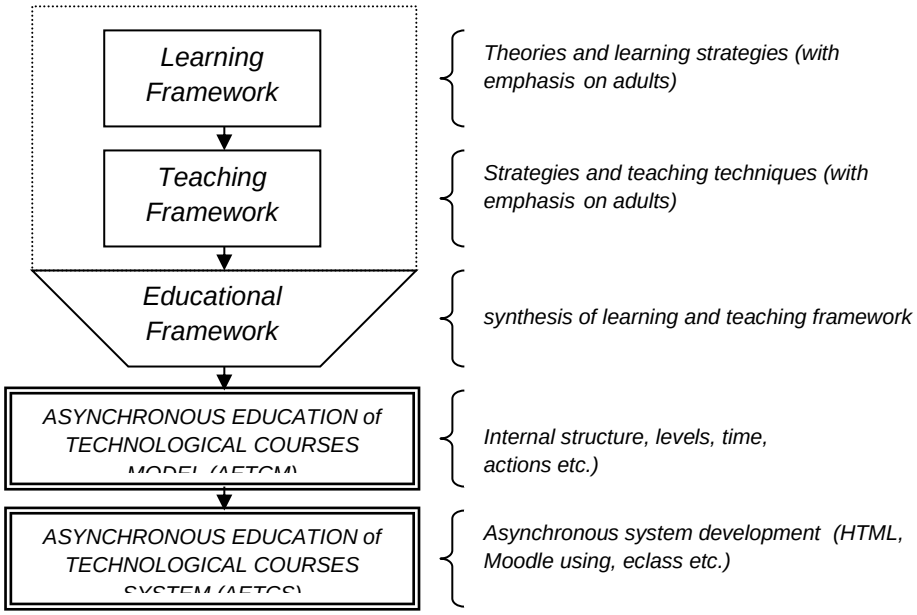
- The development procedure of a system is divided in phases and not in steps (analysis, development, implementation, evaluation).
- Special methods of development project administration are used, usually adopted by the information systems development.
- In order to cover the void in the problem evaluation and the system development phase, solution to the problem, the design phase where the system architecture under construction is developed comes between.
- The tutorial systems include three parts: human resources, learning material sources and technological infrastructure sources.
- Today, the systems differentiate according the educational philosophy and its available sources. The tutorial systems must be "open" and ruled by a student centered educational philosophy. In the centre of the learning environment is the trainee who is surrounded by the instructors, other students, learning material sources and software tools that facilitate learning and the operation of the learning procedure.

Methodology

The methodology concerns the teaching of technological or professional cognitive objects. The technological class or teaching material includes not only theory but concretisation skills too that presuppose the use of all senses, and aren't only servile work. In addition the process of learning in such a cognitive object cannot be characterized from simple activities as memorization,

rationalisation and rethinking bus it should it includes also more composers processes as creation experimentation and feedback as well. At the following form (Fig.1) are presented the phases of creation of the WbE educational model according to their time of creation (Papachristos et al., 2010b).

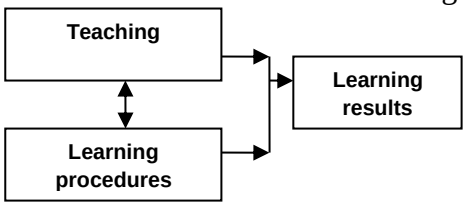
Figure 2. Phases of the creation of the educational model for WbE



Pedagogical Analysis and Design

The learning result is associated with the learning procedures during tutoring (Figure 3). Therefore in order to design an educational model, it is important to determine the learning framework, that is the procedures considered necessary so as to reach a satisfactory learning result.

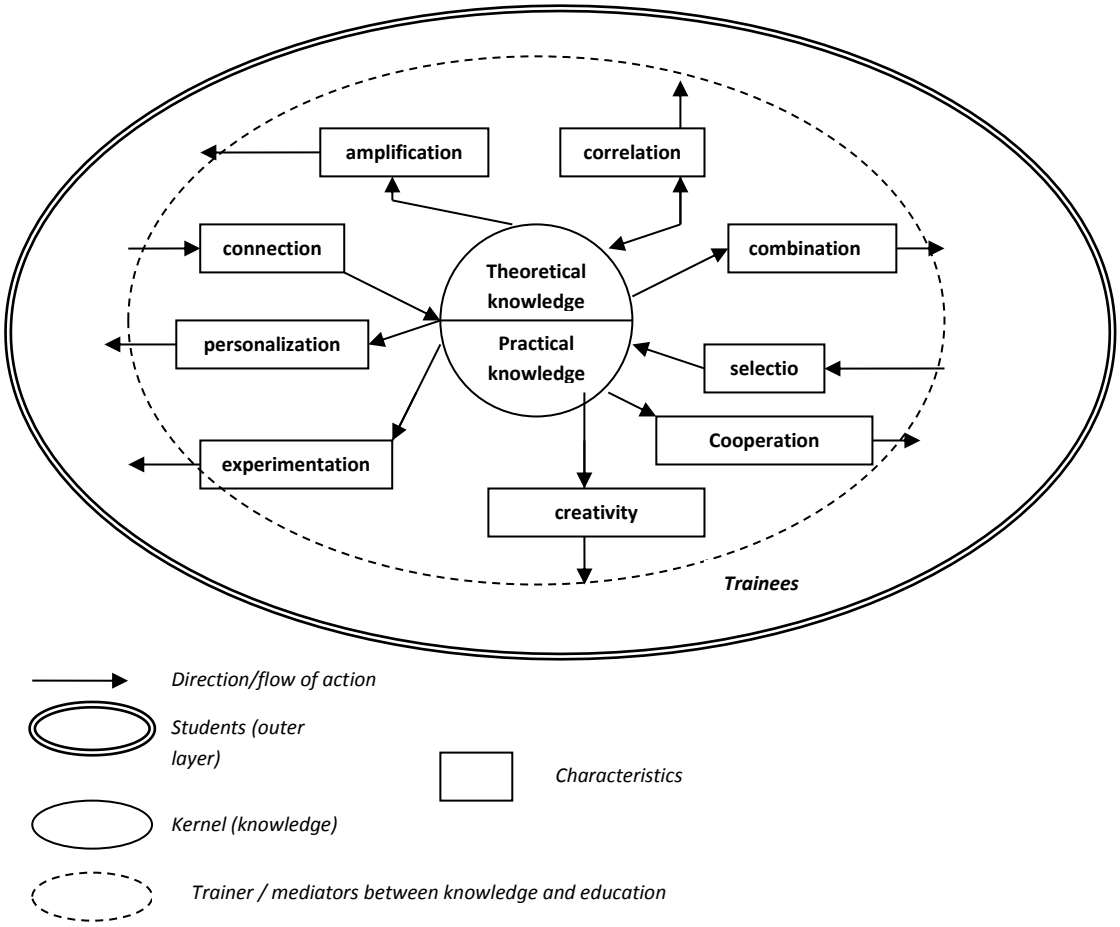
Figure 3. Factors influence the learning outcome



In the learning procedure of a cognitive subject with theoretical and technological/practical dimensions, the practical knowledge should be counted as well, as it is a basic element of the general knowledge of the subject. On that point, it's necessary to refer to the simulation procedure as a learning procedure and "substitution" of the practical knowledge with the laboratory practice (laboratory education) or work places (studentship) with a "*visual environment*" created by a computer. The *simulation* as an imitation technique of a system's behavior by another system holds a prominent place within the limits of the educational applications of the Information and Communication Technologies (ICT). Especially in the digital image area that side is evident. However simulation doesn't only have to do with vision areas. It expands in other extremely complex areas, such as human voice and sound, the scientific behavior of models, the social and economical system evolution and finds the ideal area of application, in electronic games and education (Alessi και Trollip, 2001,Komis, 2004, Plagiannakos, 1995).

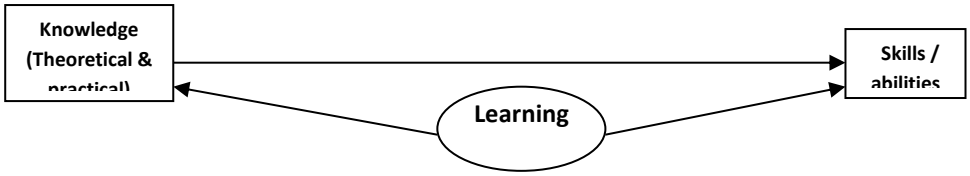
The knowledge's kernel (theoretical, practical) of proposed model, expected to acquire in a technological course and the educators takes the place of an intervener-coordinator between knowledge-trainees. This named *LEarning Framework (LEF)* and based in theoretical analysis of the library resources (Fig.4). The *LEF* is implemented with the help of new technologies and *WbE*.

Figure 4. Link trainer - student / s in the learning context (LEF)



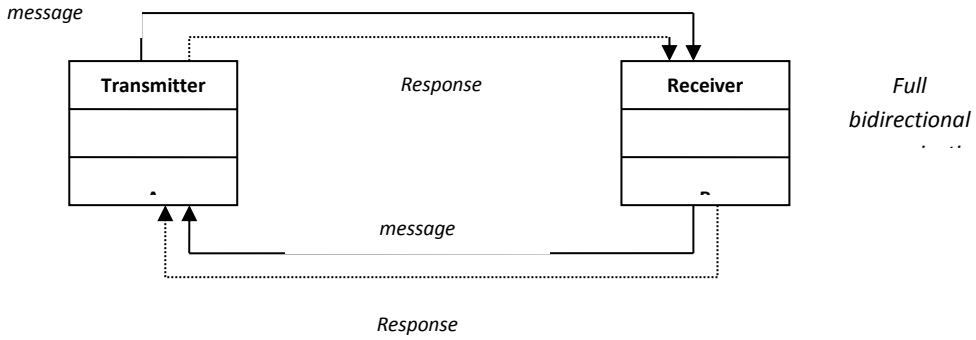
The *LEF* kernel that represents the potential knowledge of the technological or professional cognitive subject is a dynamic whole that interacts with the students/s with energies via their educator. These energies are the actions required of the system to be developed in order to fulfill the *LEF* principles. The combination of such knowledge results to the acquisition or improvement skills and abilities that meet the targets of each course (Fig.5).

Figure 5. Connection course skills-abilities



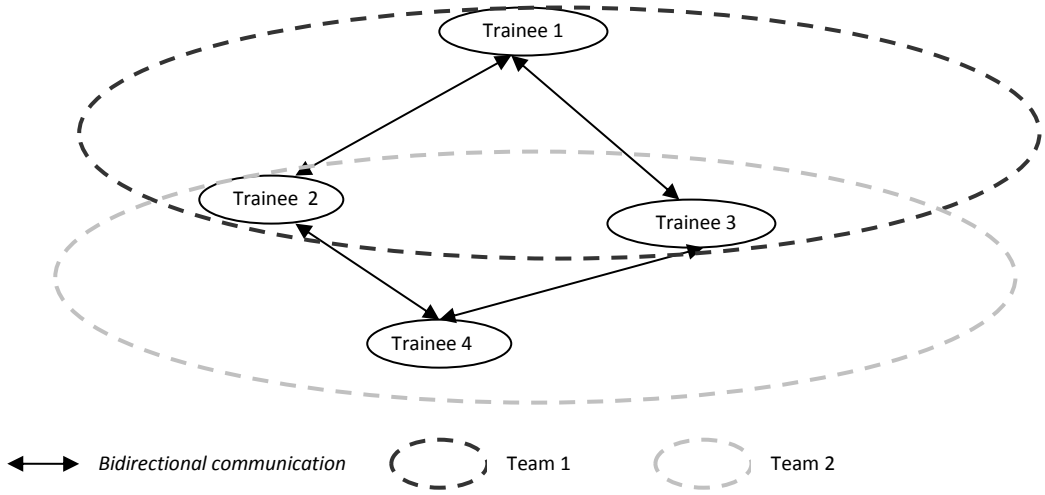
In LEF followed *bidirectional communication* (asynchronous dimension of the proposed model) (Fig.6).

Figure 6. Bidirectional communication in LEF



Parallel, there are relationships between trainees which develop the collaborative and team participation, in exercises and projects. The relations between trainers are shown in the following figure:

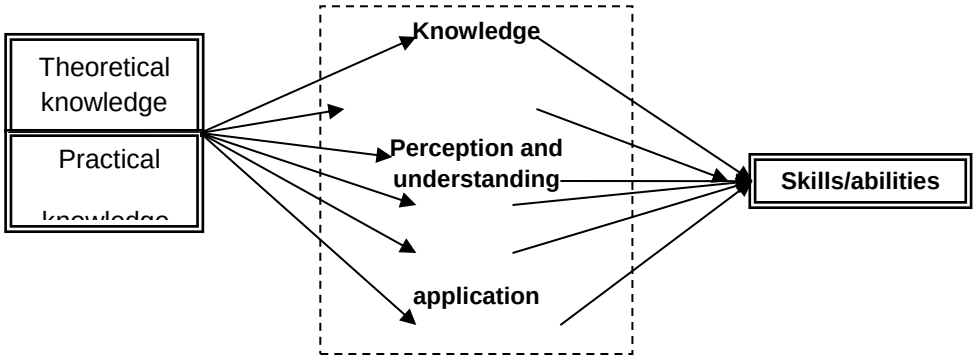
Figure 7. Relationships between trainers in LEF



Using *Bloom's taxonomy* (1956), the targets of a technological or professional course should be ruled by the following (Vrettaros et al., 2004, Diamantopoulou, 1990) (Fig.8):

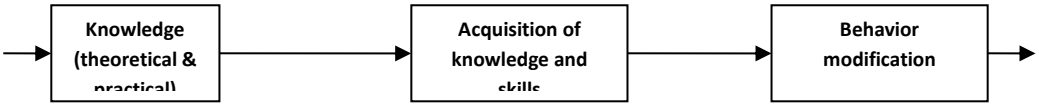
- *Knowledge*: technical terms, classifications and categories, criteria, methodology, principles, types, structure, generalizations, theories, etc.
- *Perception and understanding*: technical terms and/or procedures (include portability, interpretation and extension of educational material).
- *Application*: involves theory into realistic situations, as well as laws, rules, etc., various technical problems.
- Analysis: includes ability to analysis of theory (data sets, events, phenomena etc.) and exploring causes and relations as regards the organization of the whole.
- *Synthesis:* includes the ability for synthesis of elements or parts for creation (creative ability).
- *Evaluation*: includes the ability to assess and value judgment of technical projects, ideas, solutions, methods.

Figure 8. The LEF in the light of Bloom's taxonomy



On the following figure it is shown the *LEF* regarding the learning result (Fig.9).

Figure 9. Learning results



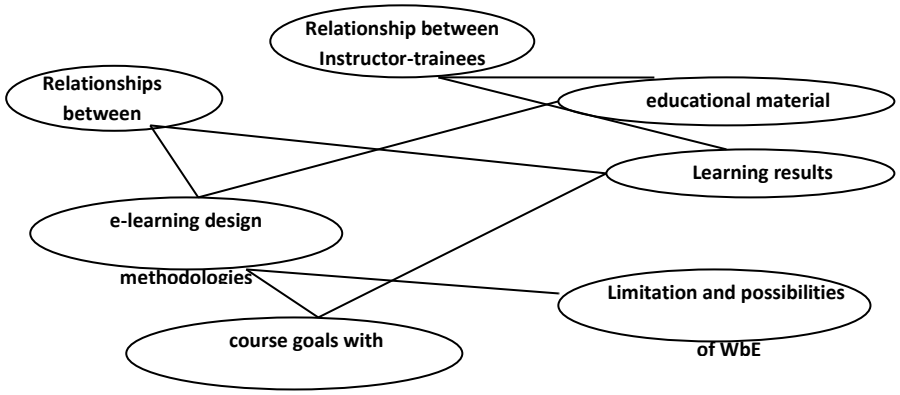
In addition the *LEF* is also influenced by the following factors because of its realization in WBE system: *(a)* e-learning design methodologies (system structure, use of multimedia, educational material, simulation, asynchronous education, synchronous education), *(b)* the methodology of development of the educational material that accompanies the proposed e-learning system and is based in combination on the *cognitive approach model* where stands the relation *Stimuli→Learning→Response* based on which it is emphasized the data procession, the coding, the storage and the data retraction (internal cognitive procedures), the *cognitive theory* of constructivism where learning evolves through teaching and *Bloom's taxonomy* regarding the cognitive sectors (knowledge, comprehension, application, analysis, composition, evaluation) and the emotional sector (inception, response) (Vrettaros et al., 2004, Retalis, et al., 2005, Tsiantis, 2001, Flouris and Kassotakis, 2003). The education material will consist of digital material, appropriately structured (gradually evolving) in order for the student to take in the whole of the course content and comprehend in a satisfactory level and at the same time to conduct applications or experiments (practical part), by composing and analyzing the information-knowledge received. In addition the student will be given the possibility through sources (via internet) and projects to seek and search subjects related to the cognitive subject. Finally, in the *Stimuli→Learning→Response* relation, *Stimuli* is a theoretical material (theory or laboratory), the *Learning* is the educational material study and *Response* is the projects & tests realization and evaluation.

Overall, the structure of the *LEF* consists of the following *interconnected reletionships-elements (R_{LEF-i})* (Fig.10): R_{LEF-i}: { R_{LEF-1}, R_{LEF-2} , …, R_{LEF-7}} (1)

- R_{LEF-1}: relationship between instructor – trainees - learning results,
- R_{LEF-2}:relationship between trainees - learning results,
- R_{LEF-3}:relationship between trainees - limitations and possibilities of Wbe - elearning design methodologies,
- R_{LEF-4}:relationship between course goals with abilities - skills - elearning design methodologies-methodologies for development of educational material (*cognitive approach model, constructivism, Bloom taxonomy)*,

- R_{LEF-5}:relationship between limitations and possibilities of WbE - elearning design methodologies,
- R_{LEF-6}:relationship between course goals with abilities – skills – learning results,
- R_{LEF-7}: and relationship instructors – trainers - methodologies for development of educational material - elearning design methodologies.

Figure 10. Internal Structure of LEF



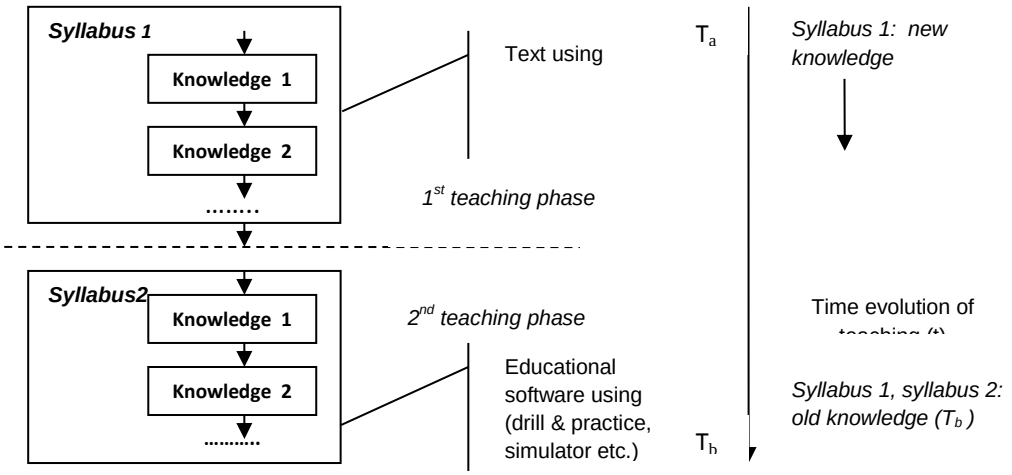
The presentation of technical and professional information, terms, definitions and knowledge in general in a technological or professional course might take place with the use of many teaching methods. The selection of the most appropriate methods depends on:

- the trainee' cognitive level,
- the trainee' experience in respective teaching methods,
- and other parameters that by and large have an influence on the teaching activity.

The teaching organization (*TEaching Framework, TEF*) should consist of the following elements (Diamantopoulou, 1990, Holmberg, 1995, Kalogiannakis, 2004, Mialeret, 2006, Flouris και Kassotakis, 2003) (Fig.11):

- organic correlation of new course content with the previous tutored content,
- organized structure of new knowledge,
- organized engagement of the teaching phases of every tutoring and
- organized use and utilization of the available subsidiary teaching means.

Figure 11. Teaching organization in TEF.

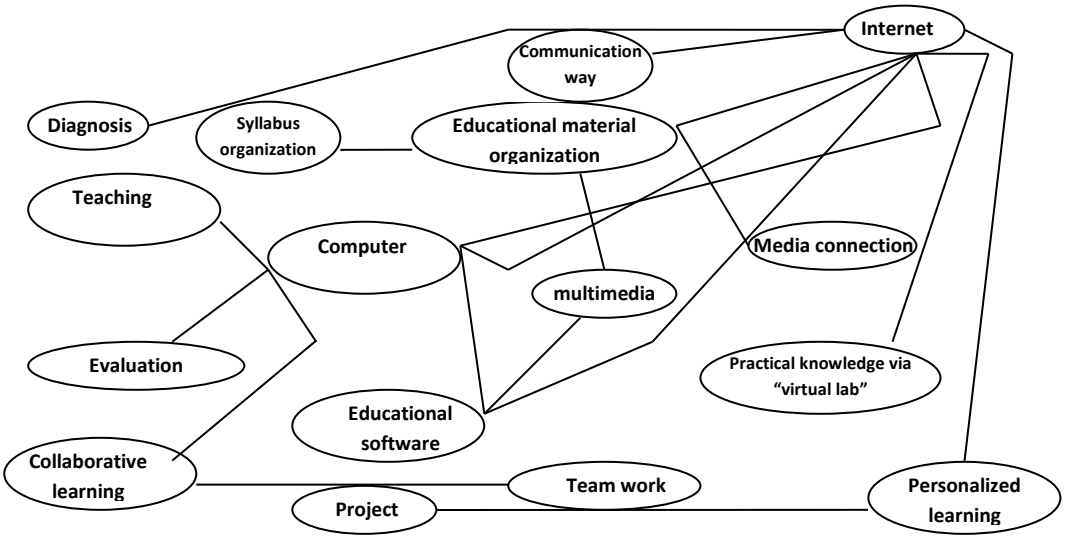


Overall, the *TEF* proposed for teaching a technological or professional course using new technologies should include the following *interconnected elements-relationships (R_{TEF-i})* in the light of WbE (Fig.12):

$$R_{TEF-i}: \{ R_{TEF-1}, R_{TEF-2}, \ldots, R_{TEF-9}\} \quad (2)$$

- R_{TEF-1}: knowledge level of trainers diagnosis – internet – computer aid,
- R_{TEF-2}: syllabus organization – educational material organization – computer aid,
- R_{TEF-3}: teaching methods selection – computer aid,
- R_{TEF-4}: communication way selection – internet – computer aid,
- R_{TEF-5}: media connection – educational material organization – multimedia –educational software,
- R_{TEF-6}: practical knowledge via "virtual lab" – internet – educational software – computer aid,
- R_{TEF-7}: project – personalized learning – internet – computer aid,
- R_{TEF-8}: team work – collaborative learning – computer aid – internet,
- R_{TEF-9}: and evaluation – computer aid – internet.

Figure 12. Internal structure of TEF

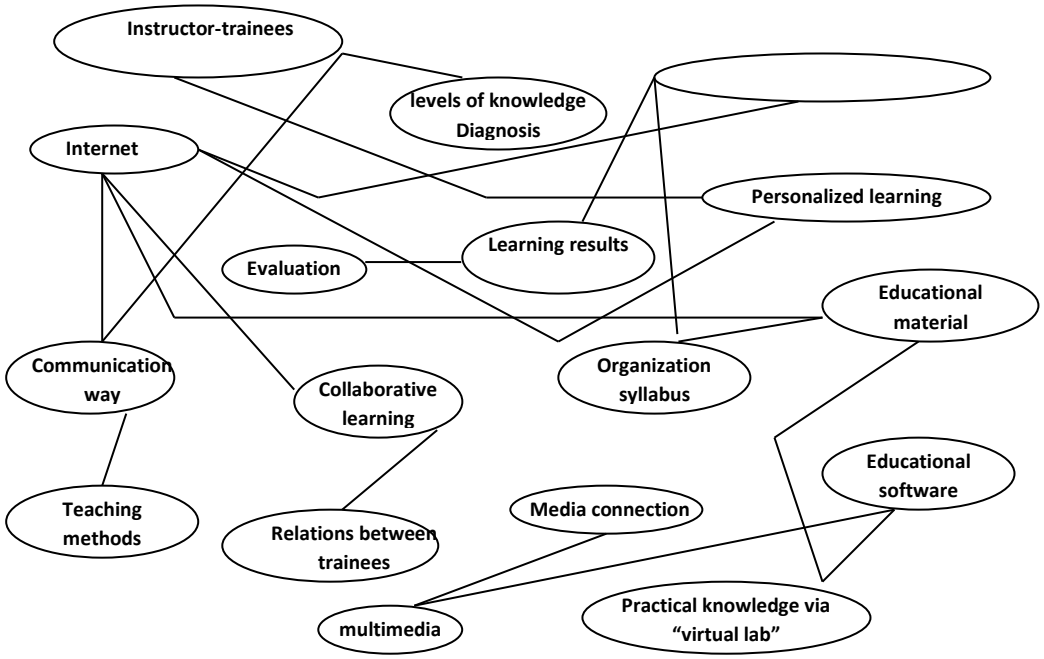


The *EDucational Framework (EDF)* of the WbE application of a technological course consists of the *LEF* and *TEF*. Comprises the intersection of *TEF* and *LEF* and presents the following *interconnected elements-relationships (R_{EDF-i})* (Fig.13):

$$R_{EDF-i}: \{ R_{EDF-1}, R_{EDF-2}, \ldots, R_{EDF-7}\} \quad (3)$$

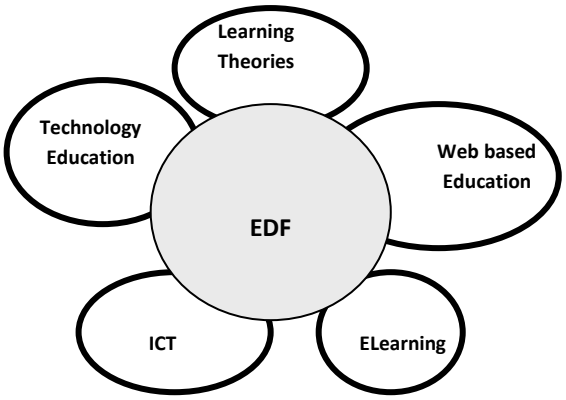
- R_{EDF-1}: relation between instructor-trainees -education level diagnosis-communication ways-internet,
- R_{EDF-2}: relation between instructor-trainees-personalized learning-internet,
- R_{EDF-3}: relation between students-cooperative learning-internet,
- R_{EDF-4}: selection of teaching method-communication way-internet,
- R_{EDF-5}: relation between course goals and abilities-skills-content organization-educational material-internet,
- R_{EDF-6}: media connection-multimedia-educational software-practical knowledge via 'virtual lab'-educational material-internet,
- R_{EDF-7}: and connection evaluation-learning problems-course goals connection with abilities-skills-internet.

Figure 13. EDF structure



Overall the EDF development results from the combination of the following scientific and technological fields (Fig.14): ***(a)*** Learning & pedagogic theories and models, (***b)*** Information & Communication Technology, ***(c)*** Technology education, (***d***) E-Learning and ***(e)*** Web based Education (WbE).

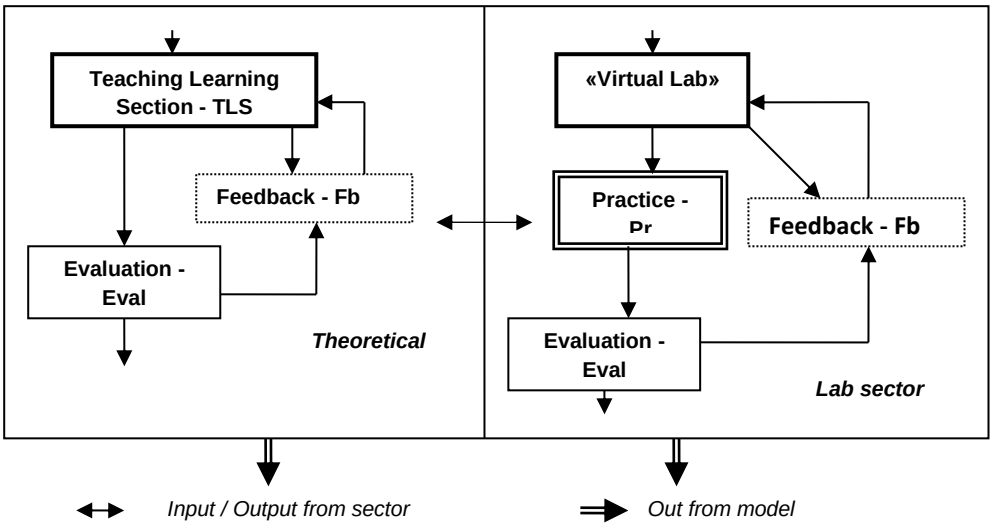
Figure 14. The scientific and technological fields of EDF



Educational Model

For the design of the *Asynchronous Education of Technological Courses Model (AETCM)* elements of relevant published theoretical models for asynchronous education were used (Arvanitis et al., 2005, Holmberg, 1995, Papachristos et al., 2007, Papachristos et al., 2010b, Papachristos και Alafodimos, 2011). The offered courses will function as completely autonomous parts in the course's web site (*AETCS*), so that each learner can take up the course without attending the corresponding conventional class. The *AETCM* consists of two sectors: (***a***) the *theoretical sector* that includes the theory and (***b***) the *lab sector* that includes the hands-on (practical) education of the technological or professional course. *AETCM*'s general structure (*theoretical sector*, *lab sector*) is outlined in the following diagram:

Figure 15. AETCM model structure

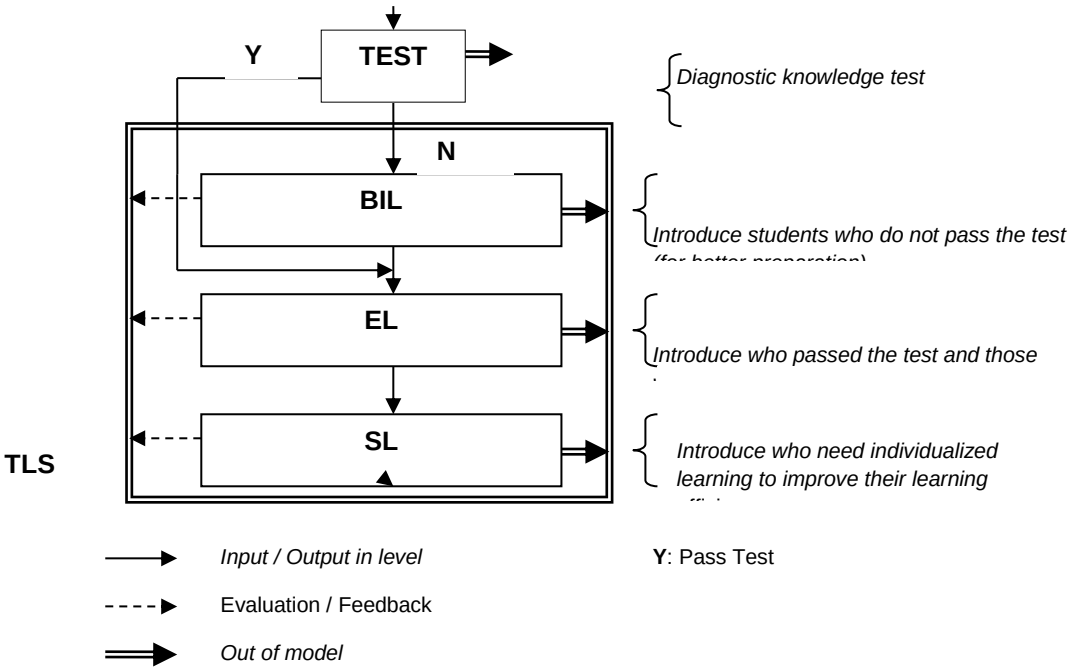


The *Teaching Learning Section* (*TLS*) consists of three educational levels (Papachristos et al., 2010) (Fig.16):

- *Basic infrastructure level - BIL (obligatory, when failing the diagnostic test).* This level is obligatory for those who lack adequate knowledge. Therefore, it provides educational material properly organized in progressive and linear structure, to cover the gaps of knowledge.
- *Educational level - EL (obligatory).* It consists of courses in linear order. These courses are mandatory for all trainees, since they provide the necessary educational material of the technological course.

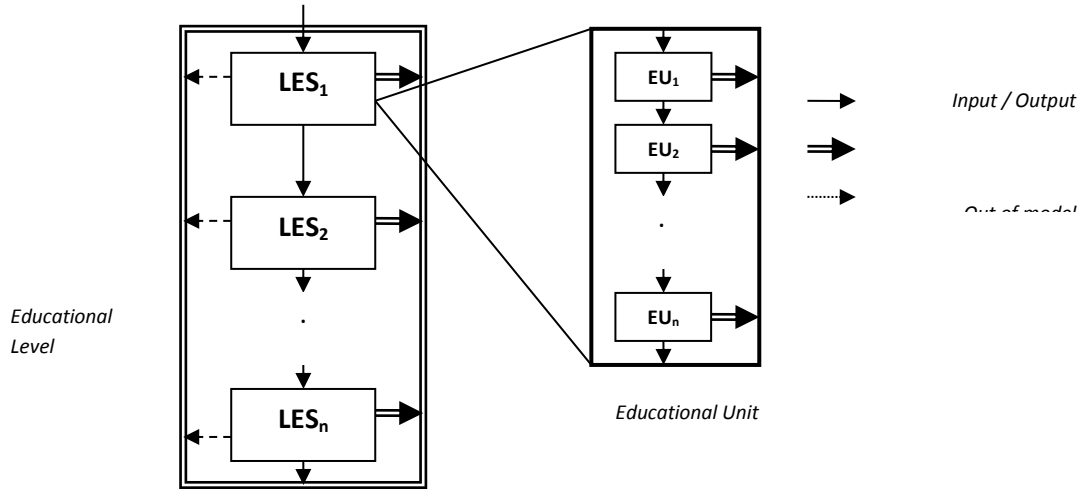
Specialization level - SL (optional). This level is addressed to students who wish to broaden their knowledge, provided that their instructors advise them to do so. Educational material structured in units with detailed analysis and exercises is provided. Also, tutorial courses are offered to enhance analysis and look into case studies.

Figure 16. Structure of TLS



Each educational level is divided in *LESsons (LES)* with linear order (LES_i with i=1..n) and each LES is divided in thematic *Educational Units (EU)* that follow a linear order in their educational presentation (EU_j with j=1..n) (Fig.17). The trainee must complete his/her first course in order to continue to the next (typical procedure) and respectively to the parts (from the first part goes to the next). In the end of each LES he/she may look at the corresponding valuation test and in the end of each level there is the final (total) evaluation that is necessary (if positive) in order to successfully complete the educational material of the cognitive subject (if in specialization level) or curry on to the level of specialization (if in basic structure level). Since the instructor discovers weaknesses in the final evaluation he/she may pass the trainee to the level of specialization in a specific LES or if the trainee wishes may enter any LES wants. In the level of specialization there are repetition courses that emphasize on the detailed analysis and exercises (solved and unsolved).

Figure 17. Internal structure of Educational level



The LES ή EU formation will follow a linear order as it si based on the syllabus organization (SYL) ruled by the instrumental correlation between the new and the previous material, that covers the previous LES or previous EU, in the organized structure of new knowledge and the organized engagement of teaching phases of each tutoring. In addition there will be an organized use and utilization of the means and methods of teaching according to the nature of the cognitive subject of each time. Hereupon the following apply:

$$SYL_x:\{EE_1, EE_2,\ldots,EE_n\} \quad (4)$$

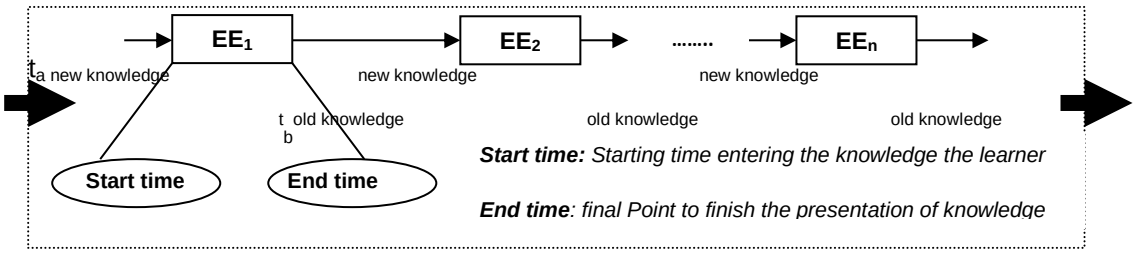
x=EU or LES and

$$\text{Educational Element}_i\ (EE_i):\{\text{principle, definition, term, form}\} \quad (5)$$

and *start time* (t_a) and *end time* (t_b) of SYL concerns the time presentation of the EE_i as new knowledge that after the presentation *transformed* (t) into old knowledge for the trainee-user until the new knowledge comes in by the system. The SYL presentation must follow the following paths as shown in the next figure:

Course layout and presentation of SYL

Figure 18. SYL path

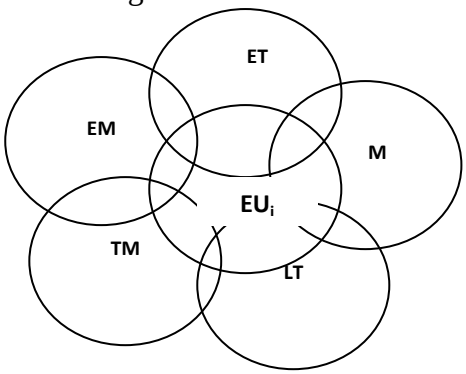


Each EU has the following characteristics (Holmberg, 1995)(Fig.19):

- *Educational Material (EM*). Use polymorphic material that consists of the following:
  - *Course Material (CM): Includes the basic learning materials* (text, simulation, case study, photos, designs, video, software etc.).
  - *Course Material Sources (CMS): includes references, sites for every EU_i.*
  - *Self-Evaluation Material (SEM): includes exersices, test, project (solved) for every EU_i.*
- *Media (M).* Educational Software, animation, video, text, digital pictures.

- *Training Methods (TM).* Every EU_i use a set of *TM*, modified according to the requirements of the asynchronous education (based TEF). Specifically used according to the theme of each EU, the following:
- -LECture (LEC)(text, designs, photos, sound),
- -DEMonstration (DEM)(video, animation),
- -Project (PR) (using email),
- -Team Works (TW)(using email),
- -Communication with Instructor (CI) (using email, telephone),
- -and Evaluation (EV).
- *Education Time (ET*). The *ET* varies for each EU. This includes study, practice and evaluation. This time it is not obligatory for the trainee. The Trainee may increase it, or decrease, depending on the rate of learning without to overcome a specific time limit set by the instructor for the overall assessment of the level.
- *Learning Theories (LT).* Every EU based LEF. The educational content every EU, follows the cognitive approach model, the constructivism and Bloom's taxonomy for organization of syllabus. In teaching procedure used the collaborative learning via team work too.

Figure 19. EU characteristics



The internal structure of a typical *EU* (Fig.20) consists of the following elements:

$$EU_i : \{P_1, P_2, \ldots, P_n\} \quad (6)$$

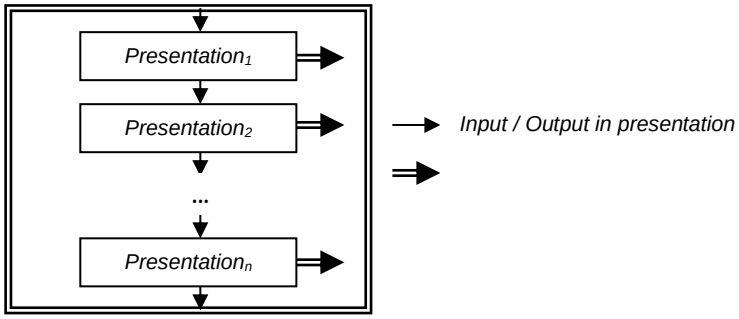
where *P*: Presentation,

$$P_i: \{LEC_j, DEM_j, PR_j, TW_j, CI_j, EV_j\} \quad (7)$$

where j = 1 .. n the number of media used in each teaching method has a presentation (e.g. P_1 = {LEC_2 } => j=2 means that the presentation makes use of 3 media). For each *Training Method (TM*) follows:

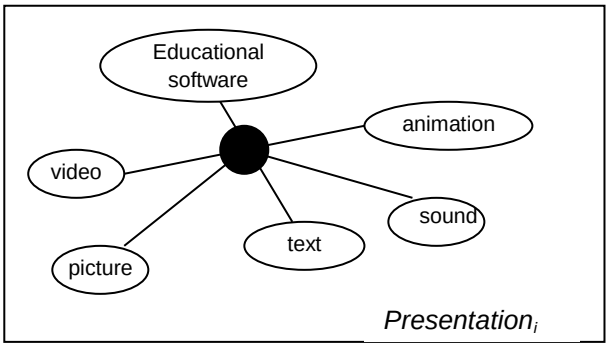
$$TM_j: \{\text{educational software, text, sound, picture, animation, video}\} \quad (8)$$

Figure 20. EU structure



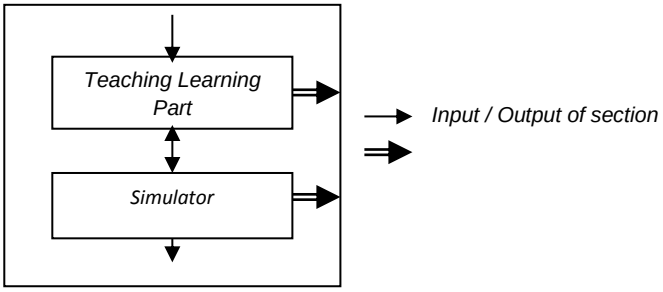
The internal structure of each presentation includes the use of media (all with all relation) as shown in the following figure:

Figure 21. Internal structure of Presentation.



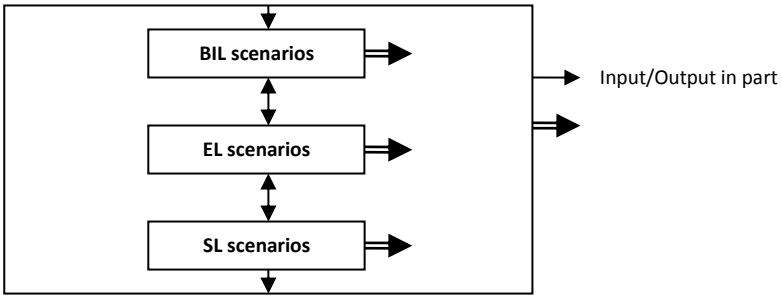
The (*Virtual) Lab Sector* is suggested to have the following structure (Fig.22):

Figure 22. Virtual Lab Structure (VLS)



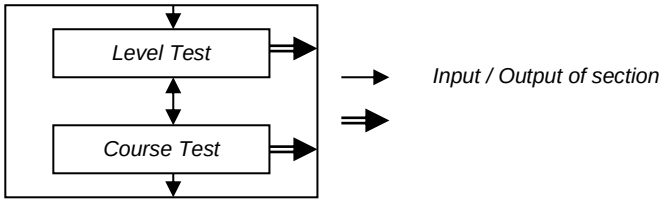
The *Teaching-Learning Part (TLP)* has the same structure as the TLS in the theoretical sector. In Simulator part, laboratorial educational software for simulation (or other educational software) is provided for lab practice in digital environment. The *Practice Sector (PS)* provides scenarios for Simulator Use by the trainees (Fig.23). The scenarios formats are provided in text, designs and images.

Figure 23. Practice sector structure



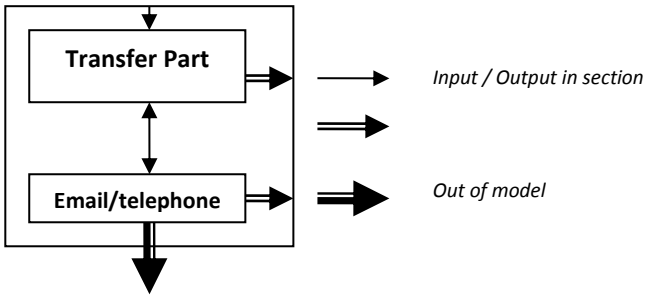
The *Evaluation Sector (ES)* has the same structure for both Teaching-Leaning and Virtual Lab sectors (TLS & VLS) as it appears in the following figure:

Figure 24. Structure of Evaluation sector



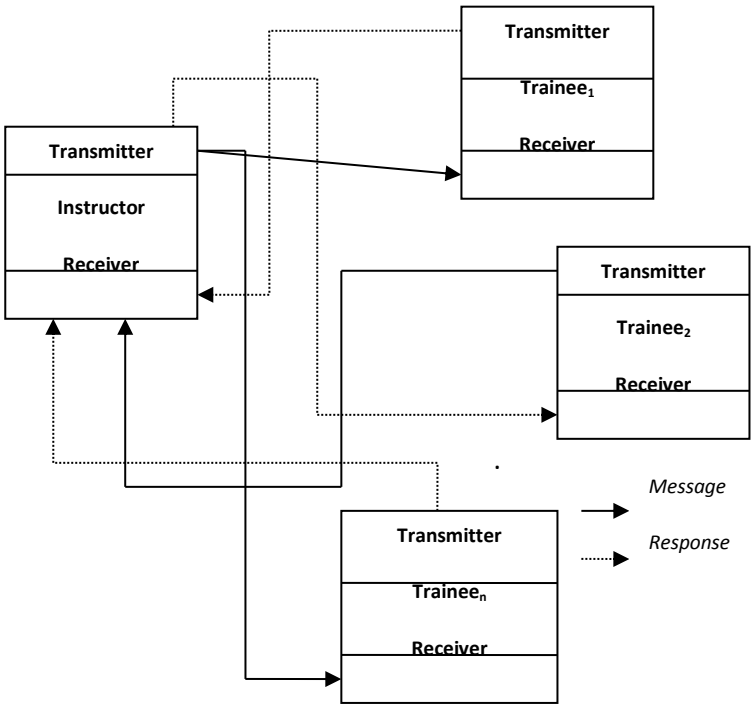
The evaluation of the students is conducted through courses tests and level test. Feedback Sector deals with the communication between the instructor and the trainees. It has the form of partial bidirectional communication and serves the following: (a) transfer of assessment tests and results, (b) transfer of questions, comments regarding the course, (c) evaluation of the system from the trainees and (d) depiction of educational directives in a forum by the instructor. The data above is transferred by e-mail via internet or telephone. The structure of Feedback Sector is illustrated in Fig.25 and it is the same for both sectors:

Figure 25. Structure of Feedback sector



Transfer part deals with the collection of evaluation forms, texts with comments, indications, additional educational material from the instructor (it can be done electronically). The part of email/telephone deals with the online communication between the instructor and trainees. The next figure shows the communication format of the *feedback sector*.

Figure 26. Communication form of feedback sector



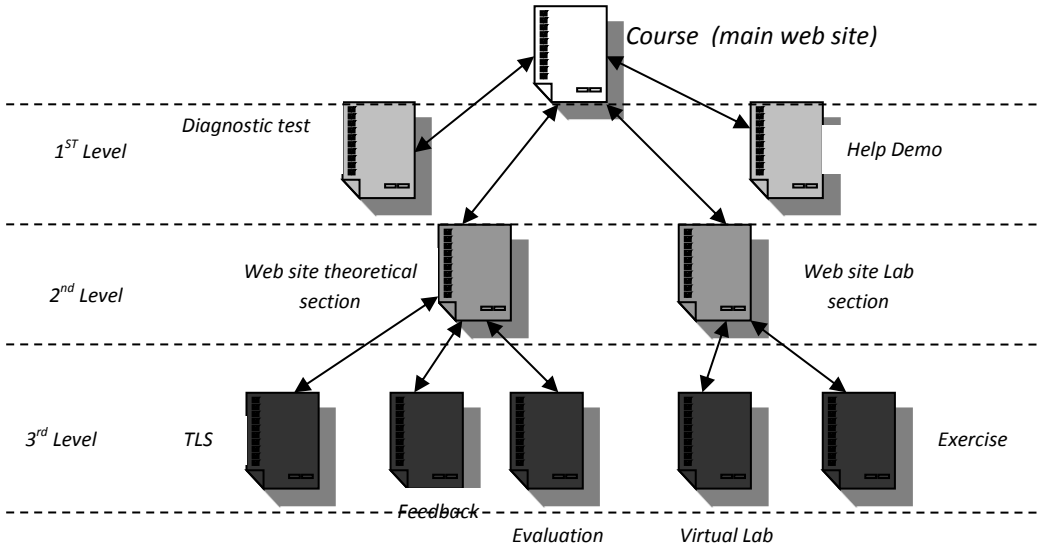
Technological Architecture of Model

The *model of asynchronous education* is very simplified and it does not need great requirements in infrastructure, in material and software, neither from the server's side that emits the information (the course) nor from the simple user (educated), that requests the information (course) from the server through the internet. The architecture design of the proposed system is made following *the principle of partitioning by task layer*. According to this principle, the system is designed in such a way, so that each of his subsystem is installed and functions in one separate server. Thus the proposed solution includes two (2) servers with the following competences (Vrettaros et al., 2004):

- *Web Access Server:* The server adapted in the environment of the *Internet Service Provider*, will accept and fulfil the requests of the users. More specifically, the service provider will entertain the central page of the node, from where the user of the system might be led either to the services of briefing, or the services of education (*Asynchronous Model of Learning*).
- *Application Server:* At the application server the applications of the system are installed, with the help of which the briefing and the education of the educated will be achieved.

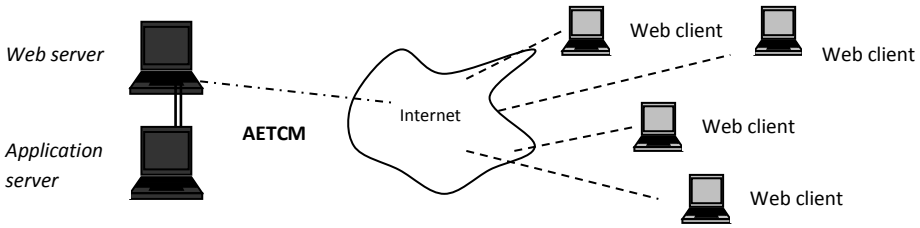
The *Asynchronous Education of Technological Courses System (AETCS*) is the structural version of the *AETCM*. The *AETCS* may be developed in any web development software such as Frontpage or Dreamweaver or PhP (HTML). It might be developed in Web site form with the tree-hierarchal shape of a web-page as shown in the following figure (Papachristos et al., 2010):

Figure 27. Architectural Structure of AETCS



The building *AETCS* based on web pages. Each building block of *AETCM* implemented in the form of site: (***a***) Presentation-site, (***b***) EU-site, (***c***) LEC-site, (***d***) Level-site, (***e***) Practice-site and (***f***) diagnostic test-site. Moreover, the choice has AETCS help to better serve the user in navigating the system. The technological infrastructure of *AETCM* shown in the next figure:

Figure 28. The technological infrastructure of AETCM



Paradigm: e-Commerce for residents of mountainous or faraway regions

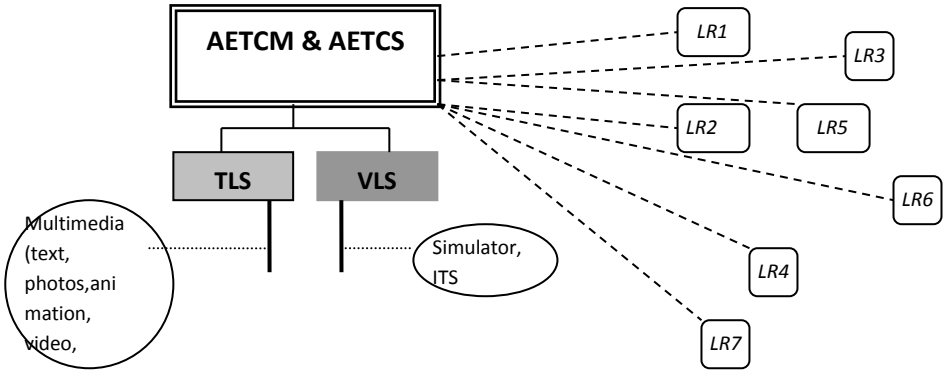
The business education requires complex learning procedures. The modern scientific and technological evolutions have upgraded the level of education and at the same time have increased requirements.In the following table (Tab.1) it is shown the connection between learning difficulties – professional & scientific knowledge in the e-commerce field and new technologies in education as it is resulted by a corresponding connection in the field of business education (with the necessary adaptations) (Clark and Mayer, 2003, Jonassen, 2004, Mayer, 2001, 2003, O' Neil and Perez, 2006, Papachristos και Alafodimos, 2011, Zavlanos, 1998).

Table 1. Examples of areas of mapping between cognitive and learning sciences and educational technology

Learning Requirements (LR)	Cognitive and learning sciences	Business cognition	Educational technology
LR1-MEM	Memory	Business case recall (e.g. reengineering situation etc.)	Decision aids and reminders (interactive multimedia systems)
LR2-KO	Knowledge organization	Mental schemata & scripts (e.g. structure of enterprise, etc.)	Knowledge and data representation (multimedia system)
LR3-PS	Problem – Solving	(diagnostic and management problem-solving (e.g. , conflict management etc.)	Simulator
LR4-HS	Heuristics and Strategies	Reasoning strategies in managerial decision (e.g. business strategy etc.)	Simulator, Intelligent Tutoring Systems (ITS)
LR5-DM	Decision-Making	Managerial decision	Simulator, Intelligent Tutoring Systems (ITS)
LR6-CL	Collaborative Learning	Trainees learning in teams	Collaborative tools
LR7-A	Apprenticeship	Cognitive learning of patient management at the beside (e.g. nursing care, etc.)	- (virtual reality an experimental version only)

The *LR* as it is registered show the wealth of technologies required to achieve a high level of education. The proposed model may cover most requirements and in addition it offers a new dimension in education: Distance Learning by Web (Fig.29). That might provide education without requiring great infrastructures from the side of Higher Education Institute or Training College and on the other hand might be a very helpful and supportive tutoring tool towards the trainee. Especially, the proposed tool is intended for residents of mountainous or faraway regions (islands etc.). It is surely required the evaluation of use of such tools for a better assessment.

Figure 29. Relationships between LRs and AETCM & AETCS



The proposed example *of theoretical realization (paradigm)* of the *AETCM model* in business education regards teaching of a cognitive subject (exclusively through internet) in the e-commerce field. The proposed paradigm of *AETCM & AETCS* on education and training, in creating e-business oriented local market and production (e-commerce). It is divided in two sectors. In the *theoretical sector* regarding the theoretical principles of management and in the *laboratory sector* regarding the use of tools for builds e-business. The paradigm's *Educational Requirements (ER_i)* are determined by the following: *(a)* ER_1-Syllabus (Tab.2), *(b)* ER_2-Lab Practice (Tab.3), *(c)* ER_3- Educational purpose of the course (Fig.30) and *(d)* ER_4-Learning goals (Fig.31). Furthermore, the paradigm should have, and the following, *Technical Characteristics (TC_i): (a)* TC_1- The system server of *AETCS* is centrally located in a mountainous area (the largest settlement with wireless or wired Internet connection and easy road access from the other settlements),*(b)* TC_2- multimedia elements for educational material, *(c)* TC_4-system server security and *(d)* TC_5- Scalability. Overall, the educational requirements and technical specifications are shown in Fig.32, which shows the total connection.

Table 2. Syllabus's Theory

No	*Course Syllabus*
1	Business Administration Principles
2	Computer Technology
3	e-Commerce
4	Infrastructure for e-Commerce
5	Strategy & Implementation for e-Commerce in mountainous areas
6	Web site Design
7	e-Marketing
8	Retail sales in e-Commerce
9	Customers in Internet & market research
10	Διαφήμιση στο Ηλεκτρονικό εμπόριο
11	Finance
12	e-Commerce B2B
13	Legal Issues in e-Commerce
14	e-Commerce and Future

Table 3. Laboratory's practice

No	*Lab practice*
1	Computer practice
2	Web design
2	(e-shop design
3	Business simulation

Figure 30. Educational purpose (in rich picture)

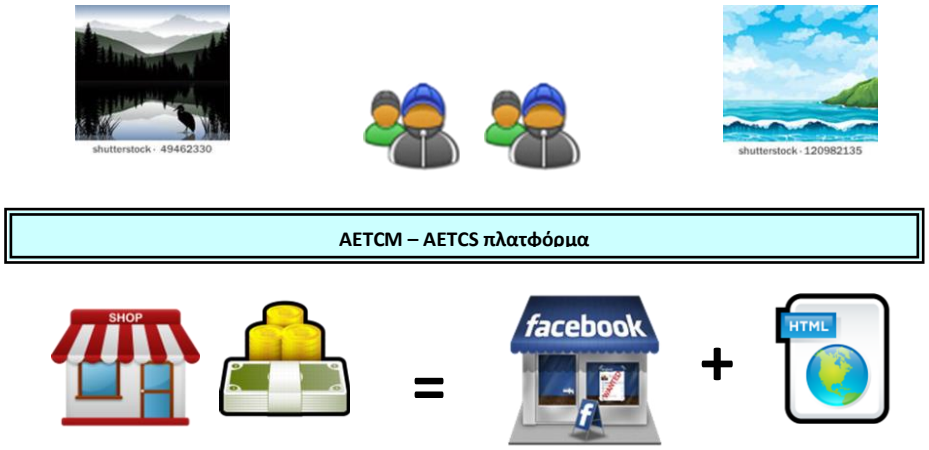


Figure 31. Learning Goals

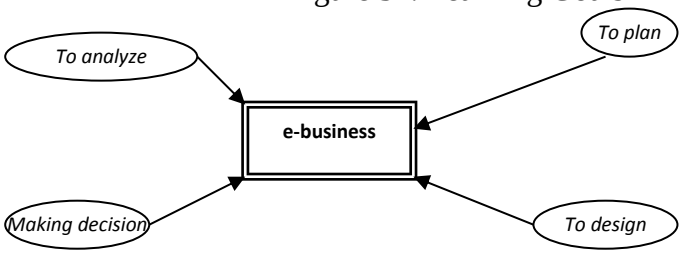
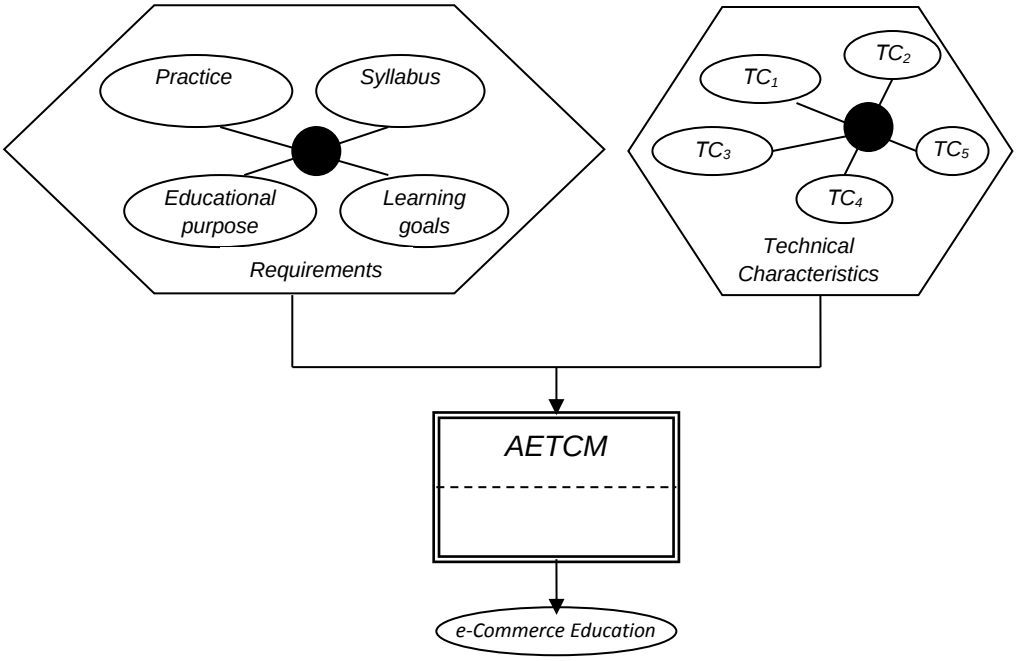


Figure 32. The overall picture of paradigm

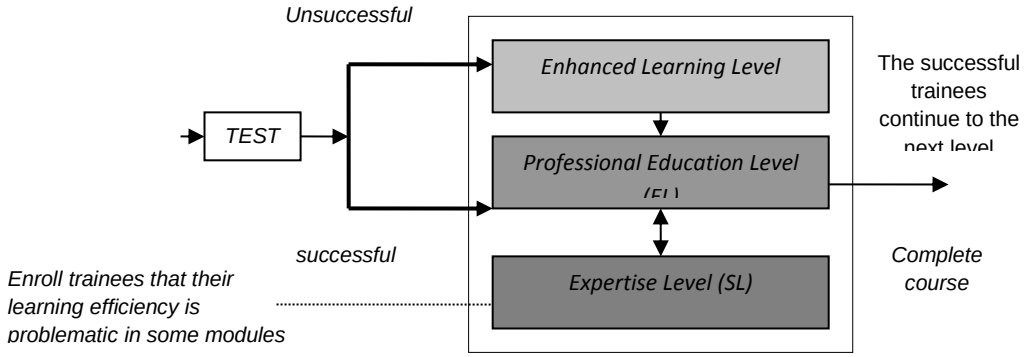


The educational procedure in the e-Commerce paradigm consists of the following educational levels (based on the proposed model):

I. Theoretical Sector (Fig.33).

- *Enhanced Learning Level, ELL (corresponding BIL level of AETCM):* that level includes the trainees that the diagnostic test ordered to attend courses of preconditioned knowledge on the e-Commerce course. On that level an educational material is offered on sectors of internet, management, marketing, e-business, and computer use.
- *Professional Education Level, PEL (corresponding EL level of AETCM):* that level includes the trainees that succeeded in the diagnostic test and attend the course of Phonetics based on its educational content.
- *Expertise Level, EL (corresponding SL level of AETCM*): on that level there is a close examination of a cognitive subject (e-Commerce course) with the presentation of specific knowledge and applications (establishment of e-business, e-commerce & advertisement, retail sales, e-support, customer's profile analysis, web design topics i.e. e-payment systems, video & voice, blogs etc.). Emphasis on open source software (to implement actions e-Commerce and minimize costs) and security issues.

Figure 33.Theoretical Sector

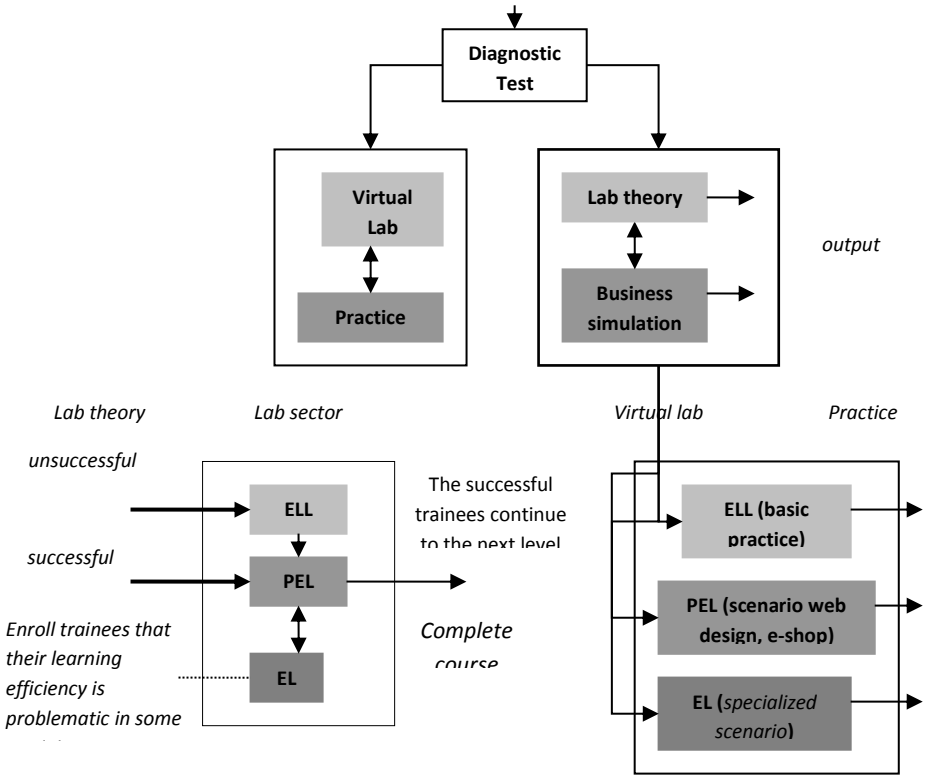


II. Lab Sector (Fig.34).

- *Virtual Lab.* Divided into two parts:
  - *Lab Theory*
    - *Enhanced Learning Level, ELL (corresponding BIL level of AETCM):* that level includes the students that the diagnostic test ordered to attend courses of preconditioned knowledge. On that level it is offered educational material on practical issues regarding computer using & internet.
    - *Professional Education Level, PEL (corresponding EL level of AETCM):* that level includes the trainees that succeeded in the diagnostic test and are going to attend the laboratory course of e-Commerce based on its educational content (web design, e-shop design).
    - *Expertise Level, EL (corresponding SL level of AETCM*): On that level there is a close examination of a laboratory cognitive subject with the presentation of specific exercises and applications (html, PhP, network programming, and usability issues).
- *Business simulation*
  - That software is used by a trainee in order to design e-shop.
- *Practice.* Divided in three levels according to the levels of Laboratory Theory:
  - *Enhanced Learning Level, ELL (corresponding BIL level of AETCM):* basic exercises in computer using & internet.

- *Professional Education Level, PEL (corresponding EL level of AETCM):* exercises for web design, e-shop design.
- *Expertise Level, EL (corresponding SL level of AETCM*): exercises for web design, e-shop design, usability tests.

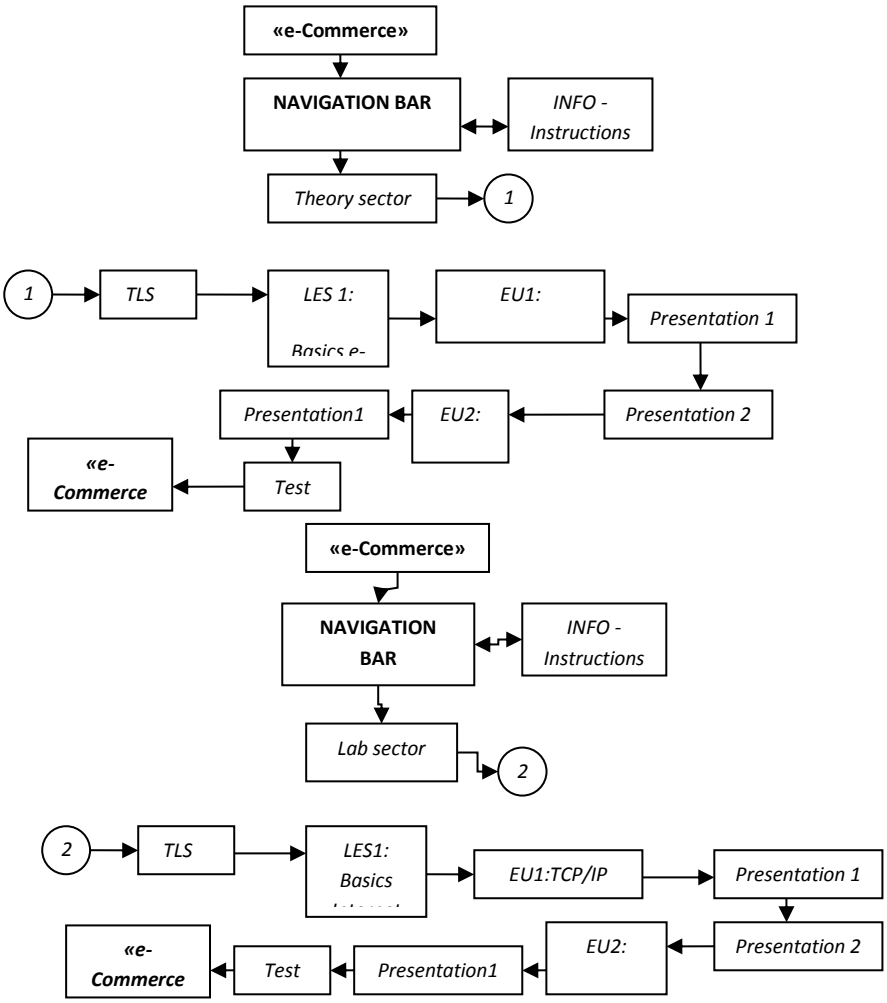
Figure 34. Lab sector



The selection procedure of each level in each field will be based on a test that will define the theoretical knowledge background of each trainee and thus he/she will be classified to the appropriate level. In addition the trainee's registration to each level will be completed with filling up a relevant form provided by the instructor to the candidate trainees and in turn they will sent it back to the instructor via email for a further processing and storage in his/her database.

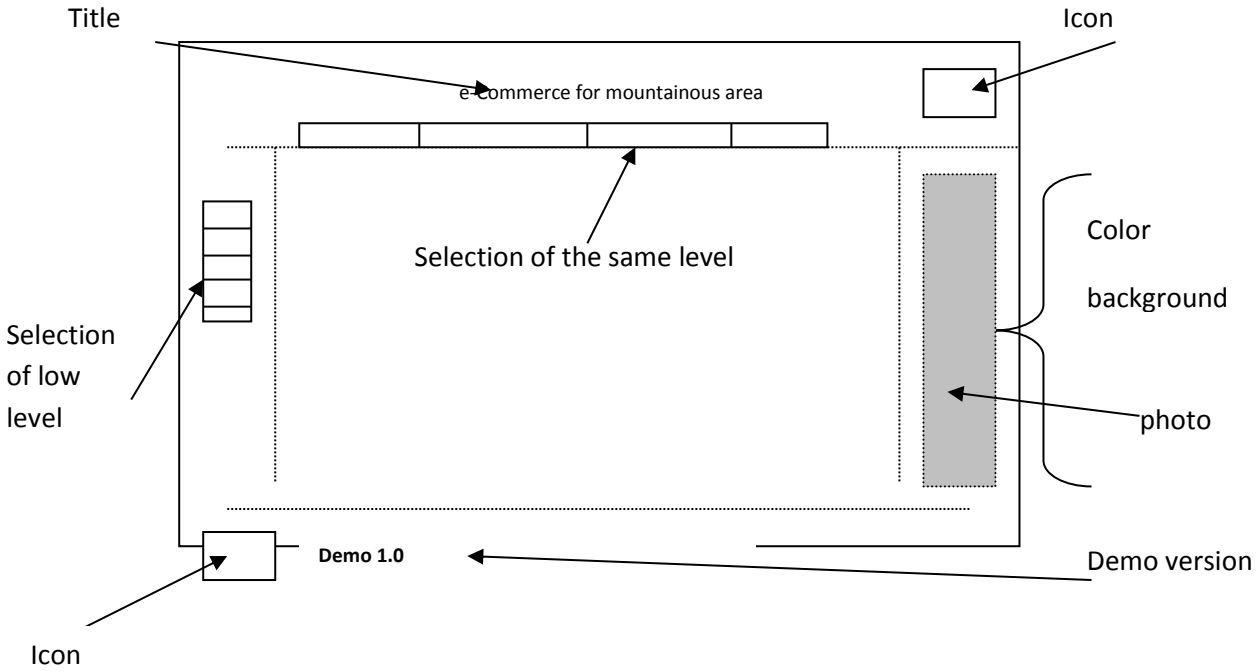
The storyboard navigation in the paradigm is both ways interactive. It is very similar to an electronic book enriched with advanced multimedia content such as: pictures, sound, text and video. Below is a use case diagram of paradigm (theoretical & Lab sector) (Fig. 35):

Figure 35. Storyboard (paradigm)



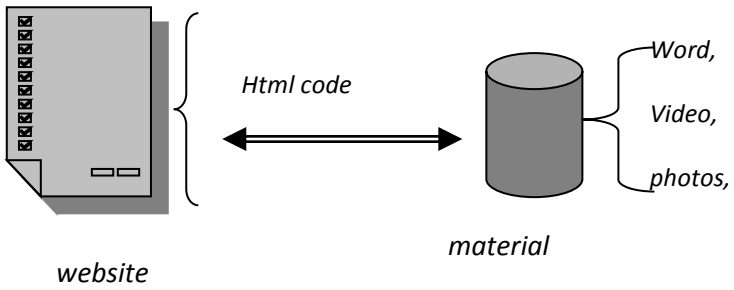
The design of the interface takes into account easy navigation and ergonomic usage. It can be implemented using any web design software tool. More specifically it offers: ***(a)*** simplicity, ***(b)*** clarity, ***(c)*** proportional dimensions, ***(d)*** proper hierarchy and ***(e)*** balance. The text in the web pages: (***a***) offers good readability, (***b***) uses legends with different colour and bold writing, ***(c***) has black colour in main text, ***(d)*** uses bold, italic and colour in keywords, ***(e***) uses tables and (***f)*** includes multimedia elements (video, animation, photos, sound). The design of the pilot interface is illustrated in the following figure (Fig.36):

Figure 36. Interface's Paradigm



The technical resources used for the implementation of the *AETCS*, and the overall structure of the system is given in the following figure:

Figure 37. Technical resources of paradigm



The architectural structure of the paradigm is based on the proposed model and the contents are presented hierarchically according to model's specifications. Each course includes theoretical and laboratorial sectors and practice, feedback and evaluation sections. Additionally, there are sections for instructions, system's usage and navigation demos.

Discussion and Conclusion

In this paper, an educational model of electronic self-learning for the creation of enterprises in the Internet from residents of mountainous or faraway regions (islands, frontier regions etc) we evolve the presentation, is presented. The aim of the proposed model is the learning of basic principles of business administration, PC and Internet use as well as the methodology of design and development of e-commerce acts. The architecture of the system (hardware, software) follows the principle of partitioning by task layer. The proposed educational model of electronic self-learning in

e-commerce offers: flexible use of media and tools, synthetic presentation of selected bibliographic texts that cover all the cognitive object, growth of cooperation and quality of education.

Learning, can be defined as the relatively permanent change of behavior or the behavioral potential of the educated, which results from training, practical action or experience (Ellis, 1978). Learning takes place inside the educated-trainee, in the *brain* and the *nervous system*. We speak of a learning process, because learning does not take place automatically, but recommends a complicated and *complex process* inside the organism, that has not yet become completely comprehensible (Tsiantis, 2001).

For the creation of the proposed pedagogic model of learning for the e-learning system in the field of "E-commerce" the following aims were set:

- The acquisition of *special knowledge and dexterities* for their application in the creation of *enterprises* in the internet directed to the local production and market (e-commerce)
- and will also concern the two categories of *e-commerce* (B2B, B2C).

The design of the proposed model of the system was based in structure of educational material. The educational material (material of presentations, case study, exercises etc) will be adapted in the level of the educated. Αποτελείται από τρία εκπαιδευτικά επίπεδα (Jonassen, 1991, 1994, 1996, Matsaggouras, 1998, Solomonidou, 2001):

- *Basic level I (beginners in the use of information technology and enterprising activities).* In this level educational material in basic knowledge of business administration is provided (principles of economy, accounting, management etc), as also basic knowledge of P.C. handling (Windows, MSOffice, Internet).
- *Level Professional education II (knowledge of e-business activities or use of information technology).* In this level educational material (upgraded in knowledge and exercises in the object that it possesses educated) in both objects is provided: business administration, web design, e-shop design.
- *Level of specialisation III (requires learning of one of the previous levels).* In this level the interconnection of two cognitive objects (e-business) is achieved aiming at the acquisition of skills of creation for electronic enterprises in the internet with emphasis on the local economy and market.

For the initial integration in a level, each candidate trainee is submitted in an electronic test (questionnaire) concerning the knowledge of business processes (comprehension of basic knowledge in business administration) and in practical training on the computer use (PC use, Windows Office software packages, Internet).

Finally, the characteristics of the educational material should be the following: as possible simpler formulation, friendly to the educated, segmental presentation of the material, explicitly determined objectives and expected results for each unit, exercises of self-assessment accompanied by the right answers and discussion on possible difficulties and errors, a variety of examples and applications, advices on how the provided educational material should be studied, frequent reports on the experience of the educated, depictions wherever they can replace a extensive text, illustrative titles, frames where important points are summarized and difficult concepts are explained, lists of bibliographic reports, proposals on further reading, directives on the recovery of additional sources, use of alternative ways of presentation of material when found necessary, explicitly formulated conscience of the various difficulties that most probably the educated will face.

The proposed system and model (AETCM & AETCS), will be evaluated by the trainees and instructors using a combination of methods of educational evaluation (qualitative and quantitative) for usability & pedagogic utility.

We hope this model (AETCM) can provide the impulse for the creation and implementation of similar efforts aimed at the development of remote areas of Greece and their approach to the knowledge society, innovation and entrepreneurship.

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