E-learning pedagogy: A value definition from a knowledge management perspective

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1. ABSTRACT

In recent years the evolution of information and communication technologies has expand further the possibility for the establishment of effective e-learning solutions. In this era of enormous transformation in education a number of key questions are arising. The effectiveness of learning systems, the justification of web based learning processes, the learners satisfaction and the analysis of the educational product are only a few of the most critical dimensions for the design and the implementation of an e-learning course. Our paper discusses the value dimension of e-learning and tries to formulate a synthetic approach for the evaluation of any e-learning system. Three key concepts seem to be the cornerstones of our analysis: Knowledge Management Capabilities, Integration and E-learning Pedagogy.

2. INTRODUCTION

For several years the new emerging technologies of ICT's provide limited support to the educational systems. The e-business revolution force a consequently reconsideration for the importance of new technologies. The new term of knowledge Management became a critical success factor for the utilization of knowledge assets [1]. The e-learning marketplace is full of products that promise effectiveness, increased performance and well managed solutions [2]. In this market there is a variety of products that in our opinion usually fall in two main categories: Products that manipulate effectively the case of class management with limited capability for

the reusability of learning objects and platforms that try to perform knowledge management mechanisms for learning objects. With no doubt the concept of reusability becomes the key issue for the new e-learning initiatives.

The enormous effort that is required for the transformation of learning content in formats ready for delivery through Internet or intranets is not enough for the establishment of life long learning initiatives. The majority of the e-learning implementations, today, seem to concentrate on static htm pages, incapable to provide dynamic characteristics for learning. The reusability of learning objects often is over passed since it requires an extended knowledge management mechanism capable of supporting the various phases for the realization of the knowledge diffusion. The readiness of the educational institutions as well as the willingness of the organizations to promote such dynamic solutions has been analyzed many times by academics and practitioners [3], [4].

In the most of cases the e-learning initiatives do not keep their promise. Their purpose to support effective learning and their increased availability are limited due to the low degree of learners' satisfaction. From this point of view is more than clear evident the necessity to research for new e-learning approaches that would integrate the potential benefits of technology without loosing the pedagogical nature of learning. Our approach is collaboratively seeking to expand the value delivery of e-learning systems through a complicated knowledge management approach. The concept of knowledge management has been for many years hidden in academics minds as a known theory but in recent years a debate has start. The critical question is: Can we embed intelligence on e-learning environments or we will continue to concentrate in fancy interfaces and sequential browsing of content. It would be very

interesting to mention a number of knowledge management definitions in order to understand the key issues.

3. KNOWLEDGE MANAGEMENT FOR VALUE JUSTIFICATION

3.1 Knowledge Management Literature Review

The knowledge management literature is full of approaches for the definition of Knowledge Management [5], [6] [7], [8], For example according to (O'Dell, 1998), KM *is a conscious strategy of getting the right knowledge to the right people at the right time and helping people share and put information into action in ways that strive to improve organizational performance*.

Lets take into account the case of the development of an e-learning course, e.g. A master course for Electronic Commerce. In this case, if we use the above definition of knowledge management then we have to develop a strategy that will allow a dynamic system capable of sharing and putting information upon requests. Of course the “put” of information is not as simple as it sounds. For example if we use several URL links or a number of accompanied journal papers or some extracts from books we have to develop a mechanism for reusability [9]. More over the sharing of putted information is also more complicated. For example the traditional e-learning platforms’ approach to load content to indexes or tables of contents, makes difficult the rearrangement of content.

According to (Beckman, 1999), KM *is the formalization of and access to experience, knowledge and expertise that create new capabilities, enable superior performance, encourage innovation and enhance customer value*. According to Tuscon, Knowledge *Management is a cross disciplinary practice which enables organizations to improve the way they create, adopt, validate, diffuse, store and use*

knowledge in order to attain their goals faster and more effectively. A consistent theme in all espoused definitions of KM is that it provides a framework that builds on past experiences and creates new mechanisms for exchanging and creating knowledge.

Most working definitions in the literature point to the same fundamental ideas which is that knowledge management can incorporate any or all of the following four items: information technologies, business processes, knowledge repositories and individual behaviors (Katzer, Heckman, Liddy, Nilan, & Sawyer, 1998). With the aim of improving organizational productivity and competitiveness, the four items mentioned above permit the organization to methodically acquire, store, access, maintain and reuse knowledge from different sources.

In this context it seems that knowledge management is not just a verbose reveal of traditional approaches that used to be dressed under other terms. More over the implied connection of knowledge management to effective mechanisms of organizational learning [4] formulate the context for initial considerations.

For example imagine the hidden knowledge in processes, people minds and products or services. The enhancement of organizational memory expands further the value of the knowledge objects. In other words the organizational memory within business units is not the cumulative results of the separate knowledge from the various knowledge sources. From this perspective the development of integrated systems capable to manage effectively the knowledge in modern business units is of critical importance. The organizational intelligence sounds very fascinating but its realization in digital economies is much more difficult [10]. The given technologies promote the issue of the learning organization [11] but in most of the cases the value adding capacity of such systems is overestimated.

3.2 Knowledge Management Approach for e-learning adoption

A recent paper [12] summarizes some of the knowledge management life cycles that have been proposed in the past.

Table 1: Knowledge Management Life Cycle Models

Model	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Nissen	Capture	Organize	Formalize	Distribute	Apply	
Despres and Chauvel	Create	Map/ bundle	Store	Share /transfer	Reuse	Evolve
Gartner Group	Create	Organize	Capture	Access	Use	
Davenport & Prusak	Generate	Codify	Transfer			
Amalgamated	Create	Organize	Formalize	Distribute	Apply	Evolve

In table 1 we can see the similar approaches for knowledge management realization in business environments. If we comment on the presented life cycles then we can say that it is obvious the concentration at specific stages or phases that potentially deliver a different value level to the whole knowledge management system. The relevant verbs describe its phase summarizing specific knowledge subtasks. For example each knowledge process has to be supported by the deployment of key tasks. The capture of knowledge for example, in business environments is a difficult task. The issue of Enterprise Application Integration reveals the need to discover ways for the integration of the various knowledge sources within an organization and especially the need to make all the information systems to collaborate and to exchange knowledge objects.

In education the above phenomenon is also the same complicate. Lets consider the case of the development of e-learning courses that offer their content using the approach of case studies. If we deploy the Nissen Model then in phase one we have to capture the relevant knowledge for the preparation of content. Just consider how many different sources we can discover that could potentially offer

content for our case studies. Theories, case studies, Internet sources, journal presentations, practitioners' experiences, researchers' findings and publications, articles etc. Today's e-learning systems overpass without pain the capture of knowledge. They treat the capture of knowledge as a responsibility of the systems' author without facilitating the capture management. In Davenport & Prusak Model we can see the Codify process. Have you ever imagine how many e-learning implementations take into account this serious parameter for the effectiveness of the learning effort. This is only one of the reason that Prof. Verna Alee claims that e-learning is not Knowledge Management. Because e-learning is not a just-happened situation that secures the high performance only if we buy an e-learning platform such as WebCT, Blackboard, Lotus Learning Space etc.

3.3 A proposed Knowledge Management Life Cycle for E-learning adoption

The establishment of an effective knowledge management mechanism for e-learning implementations has to be based on specific concepts. The desired result would be the incorporation of intelligence in systems capable to manage knowledge through dynamic and flexible deployment of learning processes. The first concept in our model is the learning product. Each learning product is constituted by a different mix of value components in terms of knowledge, attributes etc. These products have to be created dynamically using the technological functionalities of the tool set. The creation of the learning products and their exploitation will be utilised under a customised mechanism on the author and the learner side.

Our KM approach is based on the belief that learning and especially executives learning is a synthetic process that delivers a kind of product, with specific characteristics to its recipients. In addition to that we have to mention that

such a product is not only tangible (e.g. a 40-hour content material, or a case study presentation) but also intangible (e.g. incorporates degrees of motivation, interactivity, problem solving capabilities etc). In general, every product due to its characteristics has a value and also usefulness.

In our opinion this marketing based approach can be really a re-designing tool for the executives training. The first implication of this approach is the need for clarifying the term of learning product. We suggest that *learning product is a value carrier (driver) that is formed through learning processes that have tangible and intangible value-adding components. The potential capacity of learning product is the full exploitation of the human capital that consists in business processes*.

The cornerstone in our methodology is the recognition that an executive training program delivers more than just content to learners. Moreover even though content is critical for the learning process in term of transferred knowledge we defined that the learning product on executives training is a mix of value delivering components. We distinguish six value components for the learning products of a system capable to support executives training: Needs, Knowledge, Motivation Elements, Problem Solving, Team Synergy and Packaging. All of them in cooperation formulate the concept of learning product that has to be constructed and delivered using ICT's in an advanced way.

The employment of technology will admit the step-by-step construction of learning product in a two-fold way. From author perspective who is the responsible for the incorporation of learning products ingredients and from executive learner perspective who is going to use the functionalities of the KM system in order to find the appropriate learning products for his/her development and to customize the learning scenarios in a value delivery mode.

Figure 1. The learning product and its value components

Our belief is that educational product is not only a schematic creation with little application value. Its components incorporate substantial value and furthermore for their creation are required specific processes. This statement potentially defines the learning product as a knowledge management component. These processes can be described as learning, value creating processes and in our KM approach various technological tools can support tool set.

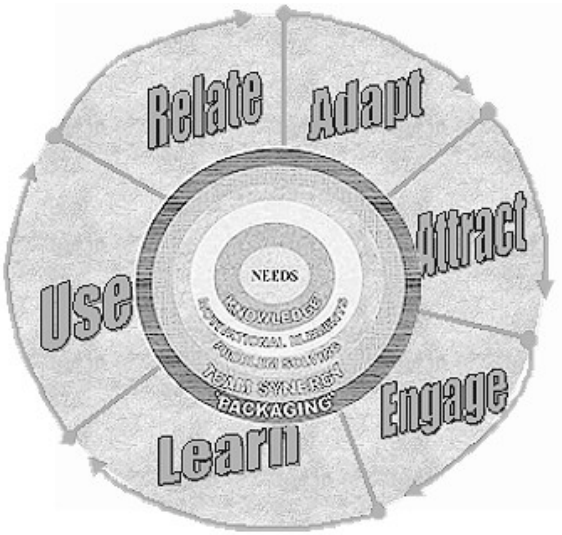
Through this approach the KM e-learning tool-set can be developed further. The Learning products construction on a real business environment has to transform business processes in specific learning products, suitable for learning purposes. On this scenario the installation of the MODEL tool-set will support a role of a Knowledge Executive Officer a man responsible to manage the people who play an important role in specific business processes in order to define the knowledge sources within organization boundaries.

In our model for KM implementation six processes form an integrated Knowledge Transformation Mechanism and provide an analytical tool for measuring the value of education. These processes are employed for the creation of the

learning products (with the components that just mentioned above) and are labeled with relative verbs: Relate, Adapt, Attract, Engage, Learn and Use.

Model	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Lytras et al	Relate	Adapt	Attract	Engage	Learn	Use

Figure 2: The Knowledge management e-learning Life Cycle



Its of these knowledge transformation processes formulate a KM framework that can be used as a guide for the e-learning strategy. The assumption is that executive training has to satisfy a number of conditions such as:

- The relation to specific training needs or problems
- The customization of content according to the discovered needs or the desired learning scenario
- The incorporation of motivation modules able to enhance the active participation of executives to the learning process
- The development of engagement mechanisms, implying more sophisticated learning situation
- The establishment of concrete learning processes efficient to achieve different learning goals

- The development of delivery modes able to support the daily business life of executives

The objective is to improve the quality and the performance of the training effort and to make easier the access to its content. It is really very interesting to expound this fundamental idea in order to set a broader set of issues including the support that technology can provide to them. Our intention is to create a full justification of the technology components that must be employed on a full-integrated KM environment for Executives Learning. The Table 2 summarizes some of the technological components that facilitate the realization of value creating KM processes.

Table 2. Technological components

VALUE CREATING PROCESS	TECHNOLOGICAL COMPONENTS
1. RELATE	Needs Assessment Tool (On – Line) Survey tool
2. ADAPT	Knowledge Base Template Base Expert System for Customization Profiling systems
3. ATTRACT	Motivation System Help Modules Multimedia Tools Interactivity Tools Problem Solving
4. ENGAGE	Role Playing Games Business Simulation Tools Interactive Case Studies Presentation Tools Group-ware Tools, Chat Systems
5. LEARN	Feedback Tool Evaluation System Blooms Taxonomy Tool Behavior Analyzer
6. USE	Intranets Integration with Application (EAI) Transfer Tool, Packaging Tool

4. THE VALUE DIMENSION OF KNOWLEDGE MANAGEMENT IN E-LEARNING

With no doubt the conceptual presentation of KM components for the realization of effective e-learning systems requires further explanation. The focus of

the analysis would be the incorporation of dynamic futures that provide support for all the different roles within an e-learning system. Knowledge providers, case studies developers, students, knowledge users and authors are only a few of such roles. Depending on the user that we want to support the KM e-learning system, we must develop subsequent conceptual models and deploy modeling processes in order to analyze the logic and the function of subsystem.

Lets consider the majority of the various e-learning systems that today dominate in the market [13], [2]. In the most of the cases the authors (teachers) of such systems cannot support specific learning processes. The vast majority of such systems provide some evaluation tools, e.g. quizzes, and a mechanism for content modules. Very few tools concentrate on the learning dimension of such systems. The deployment of information and communication technologies in the case of e-learning is limited to a few "sine que non" features. It seems that something has cause a shift of concentration from learning fundamentals to common things.

In our approach we try to investigate the hidden value that specific learning processes deliver to the knowledge providers and to the knowledge users.

4.1 Value in Learning Processes

The use of any KM e-learning system has to establish mechanisms that promote the effectiveness of learning. A long time ago many researchers have propose different approaches. Bloom [14], Argyris [15] and others set some origins. Our approach for value establishment, exploitation and delivery through an e-learning system is based on the distinction of several learning processes with specific life cycles. In table three you can see the relevant learning processes and their life cycles. The research assumption is that each learning process has a

potential different learning value and the realization of each one in a KM e-learning environment requires a tremendous effort. This distinction has further impact on the development of the Knowledge Management toolset. Each process has to be analyzed in detail and to be modeled using a modeling language such as UML. More over the life cycle for the realization of each process has to be distinguished when we refer to knowledge providers or knowledge users. Finally we have to mention that the life cycle of each process do not imply a sequential rotation of relevant tasks but rather a number of interconnected and integrated tasks. In the next page we depict the life cycle of our proposed value adding learning processes.

Table 3. Learning Processes and Life cycles from learners perspective

	Learning Processes and Life Cycles from learners perspective									
	Presentation	Synthesis	Analysis	Evaluation	Reasoning	Learning Story Preparation	Problem Solving	Collaboration	Explanation	Relation
1	e.g. Present B2C e-commerce issues	e.g. How can we promote marketing through E-commerce	e.g. Analyze the issue of mobile commerce	e.g. Evaluate the proposed approach	Reason why Java is revolutionizing the EC applications development		e.g. Develop an electronic store	e.g. Team collaboration	e.g. Explain the Importance of E-commerce for business units	e.g. Relate networks and e-commerce
2	Provide summary	Define Objectives – State the Scope of the synthesis	Present Relevant Knowledge	Present in summary the tested situation	Present scope of reasoning / Synopsis		Present Problem	Establish connection	State a thesis for explanations. Provide links for initial LO	Present generic learning objects
3	Allow detailed presentation	Find Relevant Learning products	Find Relevant Objects	Find relevant objects. Link theories and conceptual models	Find points of reasoning		Define and store sub problems	Allow structured collaboration	Search for relevant learning objects	Find Relevant object
4	Link relevant objects	Present Learning Products through templates	Discover Components	Establish collaboration sessions	Draw logical arguments for each point		Analyze concepts	Record conversations	Summarize relevant objects in template	Analyze and summarize Objects
5	Provide suggestions for further exploitation	Summarize key contributions	Define Connections – Relations	Allow application / simulation if possible	Summing up		Synthesize approaches	Organize answers	Present object	Synthesize and store findings
6	Allow personal notes	Integrate meaning	Draw conclusions	Create new meaning	Store arguments in personal workspace		Collaborate with others	Store Findings	Analyze	Draw conclusions/ state relations
7	Update personal workspace	Develop new Learning Products	Store conclusions	Store new findings			Develop knowledge objects		Draw conclusions	Create new meaning
8		Store new Findings					Store findings		Summarize synopsis	

Table 4. Learning Processes and Life cycles from knowledge providers perspective

Learning Processes and Life Cycles from knowledge providers perspective									
Presentation	Synthesis	Analysis	Evaluation	Reasoning	Learning Story Preparation	Problem Solving	Collaboration	Explanation	Relation
e.g. : Knowledge source / learning object: a PowerPoint presentation concerning Types of E-commerce	e.g. How can we promote marketing through E-commerce	e.g. Analyze the issue of mobile commerce	e.g. Evaluate the proposed approach	e.g. Reason why Java is revolutionizing the EC applications development		e.g. Develop an electronic store	e.g. Team collaboration	e.g. Explain the Importance of E-commerce for business units	e.g. Relate networks and e-commerce
Provide the Learning Object Provide the summary of the learning product	Provide in synopsis and in detail the scope of synthesis	Provide Relevant Knowledge, Link relevant objects	Provide a summary for the tested situation	Provide scope of reasoning / Synopsis		Provide Problem Description (link relevant objects)	Determine availability (off/on line tools)	Provide a thesis for explanations. Provide links for initial LO	Provide generic learning objects
Specify the details for the current object	Provide Relevant Learning Objects (papers, articles, extracts)	Provide metadata	Depict relevant theories and conceptual models	Customize learners help		Provide notes for sub problems	Define modes for structured collaboration	Provide links of relevant objects from knowledge base	Find Relevant object
Provide / choose relevant knowledge objects from knowledge pool.	Choose Learning Templates	Provide recommended parts of analysis	Provide suggestions that would facilitate learning	Provide a few logical arguments for each point		Customize learners help Provide key concepts	Determine Recording of conversations	Summarize metadata concerning synopsis of LO	Customize learners help
Provide suggestions for further exploitation	Select Support tools (collaboration, search)	Provide suggested Connections – Relations	Customize learners help	Provide suggested Summing up		Suggest approaches. Hints for knowledge exploitation	Allow answers management (link to Knowledge Base)	Choose Presentation Templates	Provide key issues
Provide questions / assignments concerning specific item	Allow posting of findings	Provide a conclusions	Allow posting of findings	Allow posting of findings		Determine providers collaboration availability		Suggest synopsis of analysis	Provide suggested conclusions-state relations
		Customize learners help						Provide suggested conclusions	Allow posting of findings
		Allow posting of findings						Customize learners help	

4.2 Expanding Value Dimension

The analysis of the value processes defines a parameterization for any e-learning system. Of course the scope of the implementation of such a system broadens the functionalities. In general an e-learning system with Knowledge Management functionalities can support academic institutions, business organizations, life long learning institutes, social organizations, training departments etc. In most of the cases the learning content emphasizes either on a subject or on a business process.

The full utilization of such a system and its value contribution has to take into account the parameter of integration. In business environments this integration could imply the interconnection to vital enterprise applications that perform the crucial business processes. The technological requirements of such a system exceed the orientation of this paper but we can state that UML and XML languages could support an extended ontological model. In the next IST call of the European Commission, we are intending to submit a proposal for the realization of this challenging but very promising model.

4.3 The MDL Model Presentation

The Multidimensional Dynamic e-Learning Model provides an analytical tool that can be used in order to position every e-learning system. The three dimensions of the model imply different degrees of delivered value.

The Knowledge Management Sophistication summarizes the ability of the e-learning platform to manage learning content in various formats, to re-use learning

modules and to support knowledge management processes such as knowledge creation, knowledge codification, knowledge transformation and knowledge diffusion.

The **E–Learning Dimension** stands for the ability of an e-learning system to construct effective learning mechanisms and learning processes that support the achievement of different educational goals. With no doubt this dimension incorporates issues like learning styles, learning needs, learning templates as well as learning specification settings.

The **Application Integration Dimension** summarizes for the e-learning platforms the capacity of collaboration with other business applications in order to obtain learning content from real business operations. This dimension seems to be the less detected on the common e-learning platforms and this causes a number of gaps for the effective implementation of e-learning systems.

The critical issue of insufficient content in many situations is due to the inability of the organizations to establish a knowledge generation mechanism through the operation of information systems that support the most important business processes. Because in general, the e-learning systems in corporate environments can play the role of the most significant intellectual capital exploitation mechanism. With the use of the MDL model every e-learning platform can be positioned somewhere on MDL cube.

More over this analysis with the three coordinates can be analyzed further. First of all by defining the scales for every dimension implying specific value metrics or different modes. This work is really very challenging and the experiences gained from the implementation of the projects can contribute important guidelines. The generic dimensions of the MDL model incorporate various issues that need explanation.

For example the e-learning dimension and the emergence of high and low value learning processes demand a well-justified way of differentiation. Our research work in this field relates with the distinction of various learning processes that suppose to be different in terms of delivered value to the learners. Each learning process has its own learning cycle, a continuum of learning tasks that reveal and exploit the learning content. Currently we have define ten different learning processes that have a different value in terms of learners satisfaction and learning content exploitation.

These ten learning processes define a pool of learning processes capable of supporting different learning modes. Accordingly to our research work an e-learning platform must support such a pool in order to provide dynamic ways of constructing the learning scene for every learner. The availability of these learning processes in the majority of the currently dominated e-learning platforms seems to be inadequate. In most of the cases this learning dimension is misunderstood or expertly missing. The critical question is whether can we gain effectiveness from an e-learning system if the employed technologies does not support sophisticated learning goal hierarchies?

The Knowledge Management Sophistication Dimension of MDL model is also critical. The majority of e-learning platforms do not support mechanisms that would enhance the re-usability of learning content. The enormous efforts that have to be paid in order to redesign learning content or to adopt traditional content for e-learning purposes burdens the effectiveness of these tools.

Our model, claims that the KM sophistication dimension is exploited enough when there are established knowledge processes that manipulate dynamic content. The re-usability of content and the support of high value learning processes

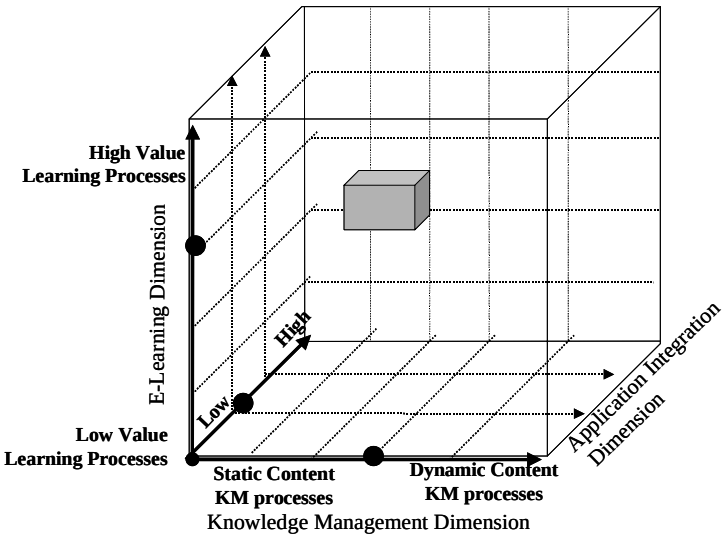
presuppose the presence of an advanced KM subsystem capable to categorize, to enrich and to integrate various learning objects. Consequently the enrichment of learning content with various metadata is necessary for the application of dynamic learning. Very few learning platforms can nowadays provide metadata to the learning content and when this is applicable there is no a mechanism that allows the data mining of relevant learning objects from the learning warehouse system that manages the learning content.

Finally the Application Integration Dimension is also very critical. The micro cell of any e-learning system has to be enriched very frequently with new learning content. In business environment this requirement is forced from the demanding business need for immediate and valid knowledge utilization. The current situation is very disappointing concerning the realization of the integration between e-learning systems and vital business applications. The development of learning content for business specific processes demands a whole development cycle with unclear quality standards. Many e-learning experts provide their expertise in order to develop the required learning material. But lets think about a module on an e-learning system that would be able to run together in background of business applications and to capture critical events from learning perspective. For example a screen-shoot, an important report, a table, and other business specific elements with more or less value for the achievement of the various business processes.

So from this point of view the MDL cube represent the whole e-learning utilization value. Potentially our exemplar for e-learning in business or academic environment delivers the maximum value when all the dimensions are satisfied to the maximum allowed scale.

The specific position for every e-learning platform has to be justified very clearly. Our research effort in this stage is concentrated on the limitation and the specification of the scale on every dimension. The establishment of such a system will allow the specification of e-learning modes. For example the three coordinates for every valid position on this cube will imply specific technological capabilities as well as learning scenarios. The selection of each mode and its implementation will of course require different levels of budget and effort. The most advanced e-learning systems positioned on the upper right corner of the cube will realize full e-learning solutions in terms of integration, knowledge management capabilities and effective learning.

Figure 3: The Multidimensional Dynamic E-learning Model



Of course the most advanced e-learning cubes need advanced capabilities of information processing. The MDL model approach sets a method for the evaluation of any e-learning platform. Of course the presentation of the method on this paper was limited due to the length limitation. The whole approach of MDL cube MODEL is supported by a number of accompanying frameworks and theoretical concepts, which in collaboration enhance the scientific justification.

The development of a system that will realize the upper right layers of the cube is currently our research priority. Of course the required modules need extensive justification and creative work. We believe than in one's year time we will be able to launch international an integrated e-learning knowledge management system with the characteristics that we mentioned on this paper. The refinement of our approach is a continuing process and will be supported by a number of new projects that we are going to propose in Greek and European Commission programs.

5. CONCLUSIONS

Our approach is setting a context for further exploitation. With no doubt the current situation in e-learning market does not represent the fascinating issue of the incorporation of information and communication technologies in education. Many people use the e-learning term and presuppose the presence of a PowerPoint presentation accompanied with audio as the technological infrastructure for e-learning realization. The MDL framework is being evaluated for more than two year and the findings are very promising. The achievement of higher student satisfaction is only one of the key findings. Finally we have to say that this model is also very demanding. It's realization requires a lot more efforts from both academics and knowledge providers that seem to forget the nature of learning when they prepare learning material. For more information about our research unit you can visit our web site (www.eltrun.aueb.gr) . For comments concerning this paper please send an e-mail at the following address (mdl@aueb.gr).

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