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NEW E-LEARNING SYSTEM METHODOLOGY

A Comparison of eLearning XML with current e-Learning System Development Methodologies

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Abstract :

The solution of the e-Learning is one of the most discussed priorities of modern universities. The whole problem lies in the global approach of which strategy must use to create e-Learning system. This paper describes an evaluation model for some of the existent methodologies used to create e-Learning system. The evaluation model is based on a comparative analysis: strategies, formation, and embedding technology and standards. The proposed comparative is realized by using the Two-Way Anova comparative, where we join some of the used characteristics by these methodologies to compare.

Keywords-component; *e-Learning, Model-Based Development Environment (MDE), MB-UIDE, e-Learning methodologies, e-Learning systems, eLearniXML, ANOVA.*

I. INTRODUCTION

E-Learning systems are applications that enable the creation of education/learning environments, integration training material, documentation and communication tools, collaboration, interaction and educational management. Such applications normally reside on a Web server in which they carry out the training actions. This type of applications allows students to connect to download contents, use the learning program to communicate with their tutors, etc. In addition, these systems and platforms allow for a better monitoring of students progress. Organizations take advantage of applications that address education, administration, continuous formation, and defining roles. At the same time, employees need easy access to information to conceive, maintain and improve their professional development.

With the evolution of the: Technologies of Information and Communication (TICs), new education/learning development strategies appear. Where e-learning strategy, is one of the major education strategies to, use the TICs with traditional learning elements. That leads us to view the e-Learning strategy as a cornerstone for technological, pedagogical and educational development. The goal of an e-Learning system is to achieve knowledge transference in an efficient way. To do so, it is necessary the adoption of an appropriate methodology that tackle the particularities of the development of e-Learning systems.

E-Learning is becoming used in the majority of the universities around world; it can be clearly observed at Spanish universities [1], like the "Univ. Complutense de Madrid", "Univ. Politécnica de Madrid", "Univ. Politécnica de Cataluña", "U. Islas Baleares", "Univ. Santiago de Compostela", "Univ. Salamanca", "Univ. Jaime I". The platforms most widely used at these universities are "WebCT" [2] and "Moodle" [3]. Some of these universities during the last 7 years have multiplied by 100 its students and have students from many other countries. The 75% of these students are older than 25 years old, 40% have children and the 90% study more than one career or work at the same time. Hence, to start an e-Learning system it is necessary to create and/or follow an organized methodology for implementing e-Learning projects that takes into account all training project factors: economics, infrastructure, technology, human resources, learning modalities, evaluation and content development, to finally have the application ready to execute and implement.

In this paper an MDD-based methodology to develop e-Learning system is introduced. Model-Driven Development (MDD) focuses on the evolution and integration of applications across heterogeneous middleware platforms. It provides a systematic framework using engineering methods and tools to understand, design, operate, and evolve enterprise system. MDD promotes modeling different aspects of software systems at an abstraction level, and exploiting interrelationships between these models. We propose a model-driven approach to e-Learning system development based on Core Object Group (OMG) MDD standards. In order to make maximum use of the Domain facilities provided by MDD, our e-Learning system is modeled by using a normative Platform Independent Models (PIM), and augmented by a normative Platform Specific Model (PSM).

This papers starts by providing an analysis of some of the currently most accepted e-learning methodologies. Next, a description of our model-based e-Learning development methods is presented. A comparison of all the analyzed methodologies is provided afterwards. Finally, some conclusions and future work are discussed.

II. E-LEARNING SYSTEM DEVELOPMENT METHODOLOGIES

There are different strategies for the creation of teaching content for e-Learning. These approaches often use a similar set of stages or phases for content development. Among them we find the classical "waterfall philosophy" characterized by the use of a number of phases strictly ordered in such a way that each phase begins once the previous one is finished; and the "evolutionary philosophy" or "based in prototypes", characterized by considering since the very beginning that, although the project starts out with a set of requirements, changes in these requirements will arise as the project is developed, and the "Investigation-action" theory that construct a continuous process, a spiral where it starts giving the diagnostic problems, change proposal design, propose application and evaluation, even though every methodology call its different phases of the strategy by a different way or combine several phases in one.

A. Methodologies

Among the found methodologies, and following in a way or other the above mentioned strategies, we have select the following methodologies for our comparison: "ADDIE MODEL" [4], "DATA Inc's" [5], "Edu-

Interpretation" [6], "Proposal for e-Learning projects development University of Carabobo" [7], "Methodology to develop e-Learning system [8], "Methodology and tools for the generalization of e-Learning in the continuous formation" [9] and "IADIS e-Learning" [10]. Where this last mentioned is used for the creation of multimedia e-Learning contents. Also we found some methodologies that do not follow any known theoretical or strategic framework; here we present some of them: "FINICIA" [11] collaborative learning, "ENN-INS e-Learning-Methodology: based on the formative pedagogic idea" [12], and finally "MDA-based Development of e-Learning System" [13].

1) ADDIE MODEL:

ADDIE model is a process of educational design iterative, it means: Analysis, Design, Development, Implementation, and Evaluation. During the analysis, the designer develops a clear understanding of the "differences" between the wished results or the behaviours, and the existing knowledge of the auditorium and his skills. The phase documents of design specify the targets of learning, instruments of evaluation, exercises, and contents. The current creation of materials of education is completed in the phase of development. During the implementation, these materials are delivered or distributed to the group of students. After the delivery, the efficacy of the materials of formation is evaluated.

Analysis :

The ADDIE model has been criticized by some as being too systematic, that is, too linear, too inflexible, too constraining, and even too time-consuming to implement. As an alternative to the systematic approach, there are a variety of systemic design models that emphasize a more holistic, iterative approach to the development of training. Rather than developing the instruction in phases, the entire development team works together from the start to rapidly build modules, which can be tested with the student audience, and then revised based on their feedback.

The systemic approach to development has many advantages when it comes to the creation of technology-based training. To create engaging metaphors or themes, artists and writers work together in a process that validates the creative approach with students early in the development cycle. Programmers and designers garner agreement as to which learning activities are both effective as well as possible, given the constraints of the client's computers or network.

Despite these advantages, there are practical challenges with a purely systemic design approach in the management of resources. In most cases, training programs must be developed under a fixed -- and often limited -- budget and schedule. While it is very easy to allocate people and time to each step in the ISD model, it is harder to plan deliverables when there are no distinct steps in the process. The holistic approach begs the questions, "How many iterations, and time, will it take to finish the program?" "Do the contributions made by

programmers and artists in the design phase, who have no formal background in instruction, warrant the extra time required and additional compensation for this time?"

Each phase in the ADDIE model includes a Interaction/Feedback and Quality Control loop that sets up an intuitive dovetailing into the next phase. The systematic approach yields significant advantages in the creation of e-Learning, making agreement on results at the end of each phase a must before proceeding. The creative approach is validated early in the development process, ensuring courseware output is optimized, and the audience is appropriately engaged.

2) Data Inc's:

Data Inc's is an e-Learning roadmap that employs a phased approach to content development. It has been adapted for the development and deployment of various e-Learning modules, including dashboards and campus gateways, as well as learning management systems. It combines some methods from a basic project management and e-Learning so the organization that uses this methodology can collect the requirements, convert them to tasks, allocate the resources, and develop and execute the program.

Analysis:

As most e-Learning methodologies, DATA Inc's tries to construct an e-Learning system by translating the traditional formation into the Internet, but it does not make any real use of the Internet advantages, like chat rooms, common resources and flexible definition of user roles. DATA Inc's just presents the formation course as a Microsoft's Power Point, which makes it a poor revolution at the e-Learning methodology world. Also one of its poor points is that its functions are not fully integrated, offering a total solution that can be utilized by multiple types of users. One of the most important points that this methodology lacks is the separation between the e-Learning content and its presentation. We can observe also that this methodology does not base upon any e-Learning standard to give more credibility to the methodology.

3) Edu-Interpretation:

Edu-Interpretation has seven-step learning solution development methodology enabling to deal with online or hybrid training opportunity in a practical way based on the objective: knowledge transfer that the student can apply in his professional life. They work in collaboration with the tutors and its approach is commercial one.

Analysis: This methodology work correctly if professional developers of an e-learning group can be hired always to develop the changes and new sections in the training process that present to learners, that suppose a high cost which discarded this methodology to be widely used. Edu-interpretation, every project is developed for just one type of e-Learning project that must be characterized before. It cannot be adopted for several projects at once, which makes working with it be a difficult issue. We can see also that the methodology does not make a difference between the e-Learning content and the way it must be presented. It just tries to construct the project in a good looking and easy way in which learner and tutor can use it easily. Even though

this methodology treats more training points than the other ones mentioned, this methodology does not base upon any e-Learning standard

4) Proposal for e-Learning project Development, University of Caraboba:

This methodology was designed to implement e-Learning projects; it is based on the investigation-action strategy that divides the development process into phases, this methodology takes into account the viability study (economic, technological, infrastructure), project elements (human resources, learning types), design, evaluation, and content development until it rollout.

Analysis :

Here in this methodology it does not support a high number of users at the same time; the user interface is not clear and is not easy to work with it. The materials offered to the users are not saved with security that they could not be changed by users or visitors. Course management and user administration is assigned to administrator users that are not related to the tutor users, which make project users depend on these persons to apply changes to the materials.

5) Methodology to develop e-Learning systems:

The idea of this methodology is developing an e-Learning system that favours the competitive position of the organization that uses it and be adaptable to suit the student/employees needs. It refers to the mode and manner in which they produce the content that will be used in training and how to determine the technological platforms to use the organization.

Analysis: This methodology creates construct e-learning systems that their content must be defined before because it needs to define the structure of the learning model. Content management is not based on any e-Learning standard that define how these contents and formation must be presented to users to be studied. This methodology just work with a determine type formats of learning contents, and the user interface is not separated from this content, where to create an e-Learning system with this methodology all, contents and it presentation are linked together. It present a high cost to administrations and university to work with it, and users have to be professional to work with these systems.

6) Methodology and tools for the generalization of e-Learning in the continuous formation :

The idea of this methodology is to create and develop an e-Learning system where persons without highly qualification in e-Learning training processes can be prepared to interact with it. This methodology is reflected in the design of a collective training plan adapted to each group of learners with personalized treatment.

Analysis:

This methodology like the mentioned before do not talk about any e-Learning standard on what it uses to present the learning content. Its design is so friendly to the user and easy to use, but the user interface and the

CMS and LMS are linked in strong way and it is difficult to separate them, which oblige after any change in its aspect or content to re-create the entire project. This methodology work with a determine type of format of documents and media, which limit its work to determine type of CMS, LMS and e-Learning projects.

7) IADIS e-Learning:

This methodology of creating e-Learning systems is proposed through the gained experience in the development of the multimedia content applications and its use in the exposition of the analysis model and design processes. The engineering teaching content project is carried out through a methodology, which divides the production process in phases and assigns tasks to each member of professional development team. To all of these different phases it is included the investigation on the suitability of e-Learning contents. All these different phases include research on suitability of the content for e-learning, a previous analysis to select multimedia techniques to apply and finally, the development of the contents based on the project design.

Analysis:

This methodology is a multimedia one, which makes it useful for media classes where students cannot interact with the presented information to the student. The creation of large-scale e-Learning content requires software developed in order to apply proved techniques of exposition and software development at a high cost, also it requires a multidisciplinary team (group of professionals). Every time this project needs to be developed it needs a high quality developer team: Teachers, whose task is to structure of the subject program, script writing, and the proposal collective agreement with the project manager on the multimedia didactic units; Project manager, who advises teachers, coordinates efforts of the development team and assigns tasks according to the planning made; Designers, for tasks of graphic design, user interfaces and creation of 2D and 3D elements; Analysts / programmers to develop software application analysis and programs (HTML, FLASH, Actionscript, PHP, JAVA); Multimedia technicians, responsible for recording editing and postproduction; Different tasks of each professional profile will come together in order to create a production line to maximize results. But that makes this project a complicated one and working with it needs always with each subject with each class or theme professional engineers.

8) Finicia:

The methodology developed in this project is based on seeking a suitable combination between distance and traditional learning, to suit individual needs, resources and labour. It is assumed that the key of this methodology is the collaborative learning. It is developed in phases, starting with the analysis of user needs, determining the methodological approach and communication platform, design and programming of course material, teacher training, and finally, evaluation and revision of the methodology and materials.

Analysis:

This methodology does not treat correctly from the first step the idea of the separation between the learning content and its presentation. It presents the traditional subjects (content, practices, classes and works) in

normal presentation without studying the student situation and his needs to understand the lessons lonely using the internet technology and the professional material the teacher prepare to him.

9) ENN-INS e-Learning-Methodology :

The idea of this methodology is to present effective and pedagogically the e-Learning contents. The ENN-ICS course consists of various courses (lessons), where learning content becomes learning objects; these learning objects are thematic and summary of the additional technical information.

Analysis: This methodology has a barrier between pedagogues and information technicians where we must now that these both groups developed their Learning-Arrangements in a disciplinary way. In this methodology we can see that teacher is the active person. The learners are the passive ones. There is almost no interaction between teacher and learner.

10) MDA-based Development of e-Learning System:

The idea of this work, is that as most companies and research departments are dedicated to, develop their e-Learning based on LTSA [1] and SCORM standards [14], specifying the format, syntax and semantics data to be transferred between heterogeneous platforms. This methodology create e-Learning systems by using J2EE [15] and oriented technology MDA. .

Analysis:

Here in this methodology even that they use a similar focus as we want to apply to present our idea, but they present it in an incorrect way which makes it lose its professional focus. Here we find that the learning materials will present to the learners in small and dependant “bricks”. The bricks are like small black boxes, almost without a logical context. The bricks are presented in a linear way. The learner has to learn all bricks in a given way to reach the learning goals. He has no chance to choose an own (individual) way. In this learning methodology arrangements have a strong theoretical focusing. The reference to practical examples is missing. So a learner isn’t able to transfer his knowledge. But without transferring knowledge, it’s very difficult to use the knowledge in new (and real) situations. One of the major problems in this methodology is the technical centering. That means, the learning materials are full with animations, video etc. But the course-designer forgets to include the necessary didactics. It’s not so easy to find a good balance for using multimedia components within learning materials

III. ELEARNIXML MODELS AND COMPONENTS

In an e-Learning system it is necessary to address different proposes and mange different information. Obviously, form one side, we find the own educational material information. Learning objects, such information is produced through content managers and follows, or must follows, SCORM standard. In our proposal we follow the same guidelines and we elaborate part of the domain model, specifically that part designed to mange teaching learning material, supported by the SCORM standard definition. But, additional information should be shaped for use and is required to mange and manipulate courses, students, evaluations, and the teaching and

learning process, this part should also be considered and shaped, so for this reason, domain model appears between Learning Management Systems (LMS) and Content Management System (CMS) and e-Learning system components (see figure 1).

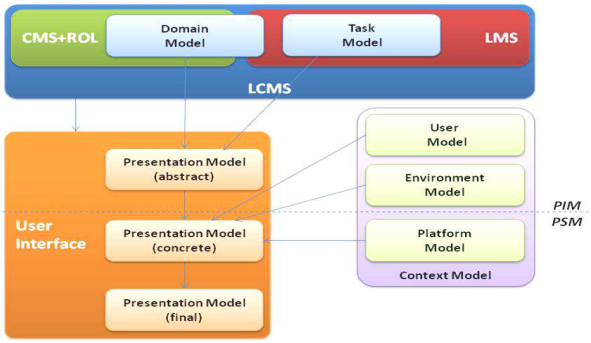

Figure 1. Association between components and models in an e-Learning system

tasks model has been associated with LMS components in order to consider and offer the links tasks with the selection and supply of learning objects and the evaluation of the own teaching and learning process. Their sequencing is linked to themselves (see SCORM) and additional consideration is not required on tasks model, even those certain tasks modulation notations (see CTT notation [16]) could be used to express temporary relations between learning objects (for example: concurrence, sequencing, interaction, enabling, disabling, etc.).

The context model is critical, as we mentioned before to consider the customization or adaption and is characterized on three elements: user environment and platform, as defined in the UsiXML propose [17]. The three models that make up the context model and platform independent (PIM) it is focus that each platform characteristic will be different and thus decisively influence in generating one or other specified presentation model.

The presentation model is a triple layer model, which is defined in UsiXML, and it is possible to address the user interface specification to different abstraction levels, both dependent and independent platforms. Our proposal is the e-Learning systems user interface, is determined by the other models, resulting in the first instance of the domain and tasks models and being refined through the context associated models.

We stress the importance that our proposal gives the user interface and the flexibility that this system component should offer to match the lower cost of using the context in which it makes use of e-Learning systems.

IV. DEVELOPMENT OF A COMPARATIVE OF E-LEARNING SYSTEMS METHODOLOGIES

Each project is unique in its development concept, contribution and objectives. Whereby each methodology, has a specific approach to, personalize their policies and procedures to develop the e-Learning

system. The methodology development is a step by step process, it is necessary to be familiar with the content, the scope and presentation sophistication (audio, video, automated, interactive, etc.), and how the evolution will be incorporated into the material. We will compare these e-Learning systems to observe their function and capacity.

We must identify and compare the process that will be needed to develop methodologies, including content management, state monitoring. It is also important to identify the simplicity in finding solutions to ensure systems rapid adoption. The criteria that we will use in the comparison of the e-Learning systems methodologies development are all criteria which have referred in one way or another with the difference that some methodologies work with more or less detail with them, which leads to observe that each methodology develop its e-Learning systems to be used in a specific field.

A. Introduction to the Compare problem

For conduct the experiment to compare the aforementioned e-Learning development methodologies, Two Way ANOVA [18] has been used. Two-Way ANOVA, determines how a response is affected by two factors. The application used to calculate the Two Way ANOVA's Formula is the "R" program [19]. R is `GNU S', a freely available language and environment for statistical computing and graphics which provides a wide variety of statistical and graphical techniques: linear and nonlinear modeling, statistical tests, time series analysis, classification, clustering, etc. Inside this program we load the "R Commander" (rcmdr) package which provides a basic-statistics GUI for R.

Here we will treat the comparison problem between the different methodologies previously presented and our methodology to propose, using the comparison parameters, these parameters are what we achieve to develop by our methodology to create e-Learning systems are cited below:

1) The evaluation is based on six criteria:

a) Usability: Easy to understand; use efficiency, memory capacity, error frequency and hardness.

b) Incapacitated Users: Visual, hearing, speech, movement and necessary requirements for disabled persons. (http://www.w3.org/WAI/).

c) Global Audience: Location (adjust the content and user interface to cope with the language, cultural and other requirements of specific target of an environment or market). Internationalization (handling multiple languages and cultural conventions without the need to redesign).

d) Standard Use: void learning technologies private mix and match content from different sources, ensuring investment in technologies… (IEEE Learning Technology Standard Committee, http://ltsc.ieee.org).

e) Content and Functions Reuse: Education Objects, modular structure.

f) System Design: Availability, scalability, flexibility, reliability.

Other critical points to take into account when making a comparison between methodologies that develop e-Learning systems are as follows: Strategic Analysis; Design and Development; Budget and resource management; Responsibility and Communication, Continuous administration support and technology use in development; Applications; Implementation Evaluation; Support and Maintenance; Reflection and Renewal.

There are a total of 81 cases, consisting of 9 methodologies and 6 criteria including 9 cases of the new methodology with the different possibilities of being able to create these criteria. The values of each criteria of every methodology depend on the student valuation note that he gives it. Where the user gives 3 notes for each question from which we can obtain his final note. The questionnaire contains the six criteria before mentioned and have participated 20 users in it of which there is 10 male and 10 females. Where 5 males and 5 females have high computer knowledge and the others are simple users. The given values are between 16 and 25. We depend on the methodologies definitions to ask the users this questionnaire.

This document will be accompanied with an appendix of evidence for this comparison called (Two-Way ANOVA test data).

B. Comparison Application

First of all we can observe the calculated media:

tapply(Data$Value, list(Criteria=Data$ Criteria, Methodology=Data$Methodology) , mean, na.rm=TRUE) #means. See results in Table I

TABLE I. METHODOLOGY MEAN

	Methodology								
Criteria	1	2	3	4	5	6	7	8	9
1	19.77348	18.80404	17.00421	18.61748	16.35454	21.14848	22.92652	22.77885	25.23390
2	19.67076	17.84466	16.01467	18.79683	17.08686	21.54953	24.24800	21.31392	24.47553
3	20.58080	18.14823	15.99923	18.28074	17.48804	20.44490	24.28455	22.59780	24.83163
4	20.76398	24.92100	15.25880	17.94557	22.78229	18.95189	19.26437	25.98821	15.25880
5	20.27913	21.07054	18.97926	19.08736	18.43858	22.10264	21.978236	23.89736	20.52917
6	21.32841	22.76932	16.26545	18.80528	20.98552	20.34766	21.81287	23.29146	24.06253

The value 1 is assigned to the variance value in order to simplify the work and to insure result equity, and for that we observe the following results:

tapply(Data$Value, list(Criteria=Data$Criteria, Methodology=Data$Methodology), sd, na.rm=TRUE) # std. deviations. See results in Table II

TABLE II. METHODOLOGY DEVIATION

Methodology									
Criteria	1	2	3	4	5	6	7	8	9
1	1.3515976	0.5400754	1.0518926	0.53685650	0.3854409	0.3315473	1.4864368	1.1023755	0.5513545
2	0.4339218	1.7591048	1.0776370	0.5362687	0.1928556	0.8878012	0.883267	0.8231900	0.5791803
3	0.3722966	1.7591048	1.0776370	0.5362687	1.6033176	0.7202345	0.8010070	0.8487009	0.2343387
4	1.0785728	1.2637459	0.9385048	1.0459676	0.8867713	1.0081301	1.1038147	1.1517370	0.9385048
5	0.7264891	0.1939834	1.6652455	0.8403468	0.5019567	1.7698383	1.1089514	1.3115447	0.5222193
6	0.9578425	0.8405313	1.7094880	0.3344236	0.7692215	0.6812457	0.9137566	0.7134698	1.5224669

There are a total of 6 characteristics to deal with and 9 methodologies, thus, that we have created 6 samples for each methodology simulating its operation with every one of these characteristics.

tapply(Data$Value, list(Criteria=Data$Criteria, Methodology=Data$Metodology), function(x) sum(!is.na(x))) # counts. See results in Table III

TABLE III. METHODOLOGY DEVIATION

Methodology									
Criteria	1	2	3	4	5	6	7	8	9
1	6	6	6	6	6	6	6	6	6
2	6	6	6	6	6	6	6	6	6
3	6	6	6	6	6	6	6	6	6
4	6	6	6	6	6	6	6	6	6
5	6	6	6	6	6	6	6	6	6
6	6	6	6	6	6	6	6	6	6

In our case we will study if the creation of a better methodology depends on the combination of the characteristics we mentioned before or it is not a factor to take into consideration. There are three sets of hypothesis with the two-way ANOVA:

1) Principal methodology effect, null hypothesis indicate that all the methodology media levels are equal.
2) Principal criteria effect, null hypothesis indicate that all the criteria media levels are equal.
3) Interaction effect of combination between characteristics and methodology. Null hypothesis indicate that the methodology effect is the same through the criteria levels and vice versa.

The obtained results after realizing the tests are as shown in Table IV:

TABLE IV. ANOVA CRITERIA HYPOTHESIS

Anova Table (Type II tests)				
Response:Value				
	Sum Sq	Df	F Value	pr(<F)
Criteria	0.60	2	0.6776	0.3920
Methodology	641.47	8	104.1583 <2e-16***	
Criteria:Methodology	16.87	16	1.3698	0.1922
Residual	41.5754			
Signif.codes	0'***' 0.001 '**' 0.01 '*' 0.05'.' 0.1 ' ' 1			

The ANOVA table shows how the sum of squares is partitioned into the four components. Most scientists will skip these results, which are not especially informative unless you have studied statistics in depth. For each component, the table shows sum-of-squares, degrees of freedom, mean square, and the F ratio. Each F ratio is the ratio of the mean-square value for that source of variation to the residual mean square (with repeated-measures ANOVA, the denominator of one F ratio is the mean square for matching rather than residual mean square). If the null hypothesis is true, the F ratio is likely to be close to 1.0. If the null hypothesis is not true, the F ratio is likely to be greater than 1.0. The F ratios are not very informative by themselves, but are used to determine P values. To understand the results please consult this paper [18].

Depending on the obtained results we can conclude that the hypothesis used as the interaction between both (methodology and criteria) is null, which can take us to claim that the creation of a new methodology does not depend just on the criteria as on the idea of it. These results can make us think that our idea of creating the "eLearniXML" is correct since we have make a combination between the criteria used in the market as the needed factors of the student and teacher.

V. CONCLUSIONS

We can observe that these strategies have similar stages in their methodology development process that because all projects development must have a work sequence to finish and present it to practice. But the main barrier is that many of these cooperatives have great lack of the formation technology use, beside a poor qualification level in basic characteristics in information management and lack in learning tools, specifically in the auto-formation. Adding to all this the low knowledge in information and communication technologies use in the formation of learning process in collaborative virtual environments, e-Learning.

All the used strategies and methodologies platforms before mentioned have appeared and none of them prevail over the others. Each platform can provide nearly the same set of services in its own way, with its own set of advantages and disadvantages. There are limits to the interoperability that can be achieved by creating a single set of standard programming interfaces, the MDD [OMG] approach, developed by the Object Management Group (OMG), places formal system models, at the core of the interoperability problem. The most significant about this approach exists in the independence of the system specification from the technology or platform. Our proposal methodology, eLearniXML, is being developed using Model based development (MDD), which we follow to develop the final e-Learning System. In our proposal we based on the ADDIE methodology that was criticized because of its late evaluation phase, we want to prove that the quality exist when the evaluation phase is being integrated in the specification steps, analyze and design phases.

The multiple tools, within the e-Learning system, mentioned in this section are available on Web comply with a standard for interoperability and effective flexible implementation. One solution is to use the extensible and adaptable standardized methodology and platform independent annotation language for exchanging information between the components of the Web-based e-Learning system as we propose in eLearniXML. Of Course, further theoretical and practical studies will give a more detailed internal structure of

the proposed web-based e-learning system and will give the possibility to design and to implement a completely functional e-Learning system.

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