

XISOA - A PROCESS OF SOFTWARE DEVELOPMENT BASED ON EXTREME PROGRAMMING AS AN ALTERNATIVE FOR THE CONSTRUCTION OF LEARNING OBJECTS

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SUMMARY

Nowadays Learning Objects (LOs) may require several types of resources, becoming more and more complex. For the development of (LOs), it is necessary to define suitable processes and interdisciplinary and multifaceted teams. This article discusses about the RIVED (MEC) development model and other defined and improved models in function of this one, and after analyzing them, it proposes a methodology with well defined stages (specification ,production, validation and publication), incorporating documents in this phases, through an agile model (Extreme Programming) that makes the integration of the development team easier and makes the (LOs) development process more effective..

Key-words: Learning Objects, Software Engineering, agile Methodology.

1. INTRODUCTION

People's lives and public and private institution passed by big changes with the invention of the computer and, as if this revolution wasn't enough, it appears the Internet explosion. The agents of these changes, the softwares

were the big responsible for a great part of the technology used all around nowadays.

One of the areas that had to try harder to fit itself into these changes was the educational area. Attendance and distance courses had many opportunities regarding these new technologies, with the creation of several courses in both modalities. On the other hand other courses had to be reformulated and others had to end for becoming obsolete, facing the revolution in the way of studying.

It realizes, inside this vision, the necessity of digital content production to support the teaching learning process and a better relationship in the educational triangle teacher x student x content, facing a didactic-pedagogic vision more and more focused on technology.

One of the biggest difficulties that any education modality which uses the new technology has is the production of quality digital contents for supporting the teaching learning process. The Learning Objects (LO) are in these characteristic.

This article aims to present a methodology proposal of a software process for the LOs development which must be according to the criteria demanded for its use and available on Interred portal.

2. VIRTUAL EPT

The expansion of Professional and Technological Education (PTE), represents one of the Federal Government of Brazil's goals and has been made by investments in the Federal Net of Technological Education expansion.

Thus, with the purpose of constructing quality digital contents that supplies this expansion demand, the federal government, through the Government's Department of Education and Culture, by the State's Department of Professional and technological Education - MEC/SETEC, have been keeping programs to develop these contents for the professional and technological teaching, as the Interred (2009), a system that integrates the ETP Virtual Portal, which is one of the Professional Education Integrated system's (PEIS) platform, managed by SETEC. Those are EPT Virtual (2009) goals.:

Offering technological alternatives back to the attendance and distance teaching-learning; propitiating a space of virtual collaboration

to change experiences and material; guaranteeing the trust and security of digital contents and its users; preserving the principles of intellectual property rights and, finally, encouraging the scientific production in ETP.

The RIVED (2009) and the Teacher Portal (2009) are also implanted. The Interred is different from these last two because it works in cooperation with several partner institutions concentrated in the Northeast Region, with the adhesion of institutions from all the regions of Brazil.

In this sphere the Federal Institute of Espírito Santo (IFES), former Technological Education Federal Center (CEFETES), participates with one of the Interred units, belonging to EPT Virtual, program used in the development of LOs for the Professional and Technological Education, that belongs to PEIS.

Besides, IFES counts, nowadays with the distance course Degree in System Analysis and Development and many attendance courses in several areas related to the region, what makes the institutions a suitable environment to be an effective collaborator of EPT Virtual.

3. LEARNING OBJECTS

Among the most accepted definitions of LOs, and frequently more used in the learning environments we have (WILEY, 2000), that define them as:

(...)any digital resource that can be reused to support learning. This definition includes anything that can be delivered across the network on demand, be it large or small.

In spite of LO praises "any digital resources", even being a document or a slides presentation, it observes that in the educational area, the LOs frequently have sophistication, being more elaborated and in condition to be implanted in a web environment. They can also have database for tests and/ or users profile.

In the EPT Virtual project, represented by Interred portal, the evaluation criteria are presented in the Table 1.

Table 1. LOs Evaluation Criteria of Interred, by criteria and quantity types. Source: (SILVA, 2002)

Criteria	Comments	Quantity
General	Deals with issues of LO documents, such as size, author other technical identifications.	6
Ergonomic	Evaluates interface with the user, such as surfing, usability and screen ergonomomy.	30
Pedagogic	Verify the LO didactic strategies, if it reached the proposed goals and	40

	audiovisual resources that encourage the different learning styles	
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Based on the criteria diversity and complexity of evaluation, it concludes that the LOs may be considered Educational softwares that earned new dimensions and outlines. We see the LO as a software in all of its plenitude and, in this context, it also has an importance of a process/ methodology of these softwares development.

4. SOFTWARE PROCESSES FOR LOs DEVELOPMENT

Characterized as softwares, the Los are, in general, start having phases of analysis, programming, implantation and tests, with the possibility of using technology for web and access to database. So, the importance of a software process starts being primeval for the development of these LOs. Software process may be defined:

As a group of, activities, methods, practices and changes that are used to develop and keep software and its products associated, that may include project plans, project documents, codes, cases of tests and user's guides. (PAULK et al., 1997).

RIVED, Distance Education Departments that aims the production of digital pedagogic contents as learning objects, makes available in one of its articles, the LO development model proposed by Nascimento e Morgado (2003), represented in the Picture 1, as the description of each one of its phases



Picture 1. Production Process of modules and Learning Objects. Source: (NASCIMENTO E MORGADO, 2003)

Other production processes based on this model were developed searching for a better structure in the several phases, with more artifacts and more better elaborated phases in the process.

Souza (2005) proposes that the neighbor phasis have communication in both ways, and also add a phase called user validation and it stars having a return link between the user validation phase and the instuctional design and other between the production of learning objects phase and the instructional design.

Vasconcelos (2007) presents a development proposal in the LO elaboration for the Physics Teaching, and it is all based on the model (SOUZA, 2005), only different from this last by the inclusion of the phase called exploratory modeling.

On the other hand, Cordeiro (2007) presents a more complex model in the models of software process vision, with well defined phases and use of agile methodology (Extreme Programming); and also interesting artifacts, Conceptual Maps, Scenario Map and Surfing. These model is alike the proposal of this article as in methodology as in the generated artifacts, according to what will be seen in the presentation section of XisOA.

These authors discuss about the model proposed by Nascimento and Morgado (2003), focusing deficiencies under several angles.

5. AGILE METHODOLOGY (EXTREME PROGRAMMING - XP)

The idea of this work is that it be presented a process that may observe the necessary premises so the Interred has a standard LO development as educational softwares.

Under this view, it believes that an agile development process as Extreme Programming - XP (BECK, 2004) may be used. The XP adopts in its development process some practices, according to Table 2.

Table 2. Group of the best practices adopted by XP. Source: Adapted from (ASTELS, 2002)

Practice	Comments
Modular	Processes division in distinct activities.
Interactive	Acknowledgement that some things go wrong before have been correctly done (learning by the committed mistakes).
Incremental	Creation of projects in small parts and not a try of total and radical solution.
Time Related	Each increment or iteration has a pre-determined longevity.
Parcimonious	Minimum number of necessary activities for decreasing the risks and achieving the goals
Adaptable	The flexibility to adapt the development (activity inclusion and/ or modification).
Convergent	After each increase, the system is closer to its final goal.
Regarding people	Os processos de softwares ágeis funcionam melhor com equipes pequenas.
Collaborative	All the participants have to understand how the parts get together, what these requirements mean and the team has to work together.
Complementary	Verifying that activities may provide feedback when combined to others in another process. So the activities that work well together almost always are a fundamental part to create a dynamic that leads to the success.

6. DEVELOPMENT PROCESS OF LO - XISOA

Due to the complexity level that a learning object may present, it considers the development description, to be presented, as just a LO.

6.1. Multidisciplinary Team

Based on the agile methodology, for the production of a LO it is important that a multidisciplinary team be defined. To compose this team we defined the following positions:

Project Manager: specialist in System Projects Management, responsible for solving all the problems related to administrative issues.

Project Technician: XisOA specialist, responsible for following the good practices of XP and guiding the team to follow all the stages properly.

Instructional Designer: specialist in education and technology, responsible for analyzing the context and the learning necessities to plan a better way of achieving the LO educational goals.

Pedagogue: specialist in education, responsible for producing and sharing knowledge on the educational field.

Technician writer: responsible for registering all the LO releasing the development team.

Area Professor: specialist responsible for suggesting presentation ways and activities the reinforce the learning.

Graphic Designer : responsible for performing graphically an idea or a group of information.

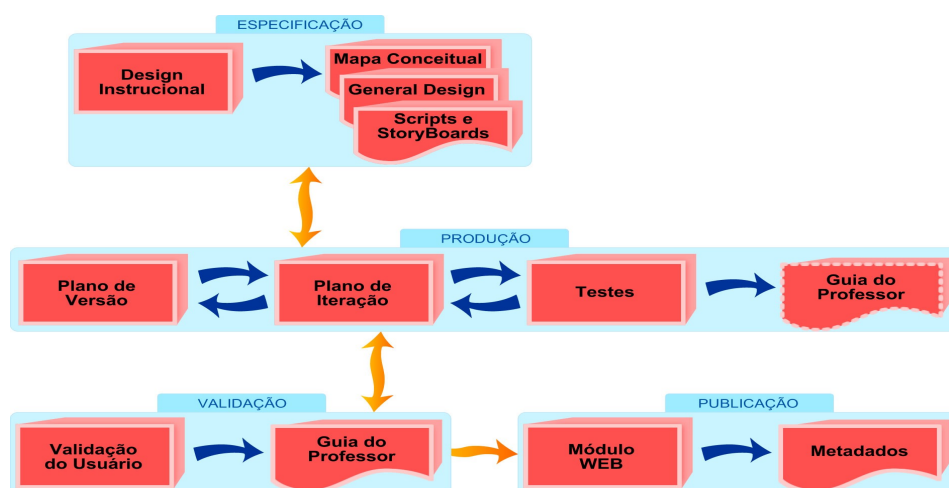
Developer: system programmer or developer analyst responsible for the LO planning and codification.

Test Analyst: Responsible for writing the acceptance tests and quickly identifying the LO defects, so those can be repassed for the team and the planning may be reviewed.

It is important to highlight that depending on the scope and size of a project, the same person may assume different positions during the process.

6.2. Model XisOA Description

The Picture 2 presents the proposed Model - XisOA.



Picture 2. XisOA - Objects development process.

In the proposed model, the learning object Specification Stage includes the Phase 1 - Instructional Design. Even if more than one LO be identified for the context, each one of these will consist in a project to be developed.

Phase 1 – Instructional Design: The same way as in the RIVED (2009) Model original proposal, this phase aims to define the learning object according to the conceptual aspects and pedagogic strategies. In this phase, we propose that the whole multidisciplinary team participate and be responsible for creating the following artifacts for the LO:

General Design - General Project of LO. They are described as: goals, abilities, previous knowledge, pedagogic strategies, among others.

Scripts and Storyboards - Scripts and sets for screens.

Conceptual Maps - with the aim of specifying the learning object scope, it is important to define the concepts that will be presented in the LO and the links between them.

The LO **Production Stage** consists in phases 2, 3 and 4 described in the following.

Phase 2 – Version Plan: After the LO specification and having all the artifacts, we now need to plan an initial version of the LO about to be produced. This phase will define an initial version that must be composed by a group of functionalities/ activities that already may determinate the LO.

The version plan will determinate which functionalities/ activities that will be developed in each version and the deadlines to release them. Besides, each

version to be developed must be divided in interactions and, for each one, it will be estimated a development time, based on the interaction complexity and on the time predicted for the version release.

Phase 3 – Interaction Plan: For each interaction, it must be elaborated an interaction plan. It means that the codification works and the tests must be defined. Based on the interaction plan, it must for each one: planning, projecting, writing tests, codifying, testing and integrating.

Phase 4 – Tests: In the end of each interaction, tests must be performed to verify the codification. In case it doesn't attend the aim properly or it presents any implementation mistake, it gets back to the interaction phase.

In the end of the LO Production Stage, it finds the following artifacts:

Teacher's Guide Version - As the same as it happens with the RIVED(2009) Model original proposal, the discipline specialists create the Teacher's Guide for the developed learning object.

LO Version - It is generated an enough functional version of the LO may pass through the user validation phase.

In the **Validation Stage** it will be made the evaluation of the artifacts generated in the stage before.

Phase 5 – User Validation: Because of this is a learning object, defined based on a specific learning strategy, for each version created with the teacher's guide, must be validated by other professors that act in the area and also by a group of students.

With the Learning Object done and attending to all defined requirements, we have the **Publication Stage** which is the Phase 6.

Phase 6 –Web Module: As the same as it happens with the RIVED(2009) Model original proposal, in the Web Module Phase the learning object is publicated on the Internet. In this phase it must be generated, as an artifact, the metadata regarding the LO.

Metadata - Fulfilling the Metadata, responsible for the LO catalogation in a precise way and a LOs replacer.

7. FINAL CONSIDERATIONS

This article described a methodology of software development based on

Extreme Programming for LO, besides comparing others that already exist as an initial aim of orientating the Interred replacer face the construction criteria of these LOs and IFES itself.

Based on the specificity of the LO production and in the best XP practices (modular, interactive, incremental, time linked, parsimonious, adaptable, convergent, collaborative and complementary), it was initially defined a development multidisciplinary team.

From the team, it was presented the proposed model - XisOA, divided in 4 stages. They are: Specification Stage, LO Production Stage, Validation Stage, Web Module Stage. It observes that the presented model attends to the demanded requirements for the development of educational softwares, with detailed stages and important and clear artifacts in the end of each stage.

Thus, this work becomes an important standard of software development, using the agile methodology and with a multidisciplinary team, it will reach its the expected goals with a compromised and correct team as a pre-requirement, which is one of the pillars of XP success.

It expects that the LOs now developed, using the XisOA methodology in Interred and at IFES, attend to the perspectives and that the future works make an analysis of the obtained results using this methodology. Another point to be explored consists in establishing development criteria that favor the collaboration and the cooperation between student-student and between professor-student in the LO use.

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