X-TEC: Techno-Didactical Extension for Instruction/Learning Based on the Computer

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Abstract: In this brief paper we will propose a new development model for Educational Software called X-TEC. It will be based on the paradigms of software engineering applied to the construction of educational software. This model will allow developers of educational software to reduce the gap between instructional design and technical development. Our approach presents two overlapping extensions: the instructional model and the learning environment. The instructional model will be related to the instructor/educational software and the learning environment will be associated with the student/educational software. The X-TEC model promotes the interaction between these two extensions, allowing for the deployment of a common development platform.

Introduction

In general, educational software is based on development methodologies or methodological approaches, concerned fundamentally with processes or data. Its lifecycle has been supported on two different and independent stages: instructional design and technical development.

The gap between the skills and the terminologies typical of these two stages usually leads to a problem: the final product is far away from the initial requirements proposed by the author. Consequently, these approaches usually create a high risk of obtaining low quality products.

In this work, we analyze some of the existing structured methodologies such us [Yourdon, 1998]) and object oriented methodologies [Booch, 1991] [Coad and Yourdon, 1991], [Jacobson, 1992], [Rumbaugh, 1994].

This study led us to conclude that although Object Oriented approaches seem to be more adequate than Structured approaches they still fall short of solving the above mentioned gap between instructional design and technical development. We argue that there is a need for a new model focused on results.

This orientation is very an important due to the high quality demand placed upon educational systems.

We found different methodological approaches proposed by different authors but none of them seems to fill the required quality patterns. The X-TEC model tries to solve this important problem.

The process of creating this new model is supported by the software engineering paradigm proposed by Pressman.

X-TEC Conceptual Model

The X-TEC model presents two overlapping extensions: instructional model and learning environment. This model will promote an interaction between these two extensions, allowing for the deployment of a common development platform, represented in fig. 1.

This platform has accurate quality factors settled on a multifaceted conception described by a set of internal and external factors.

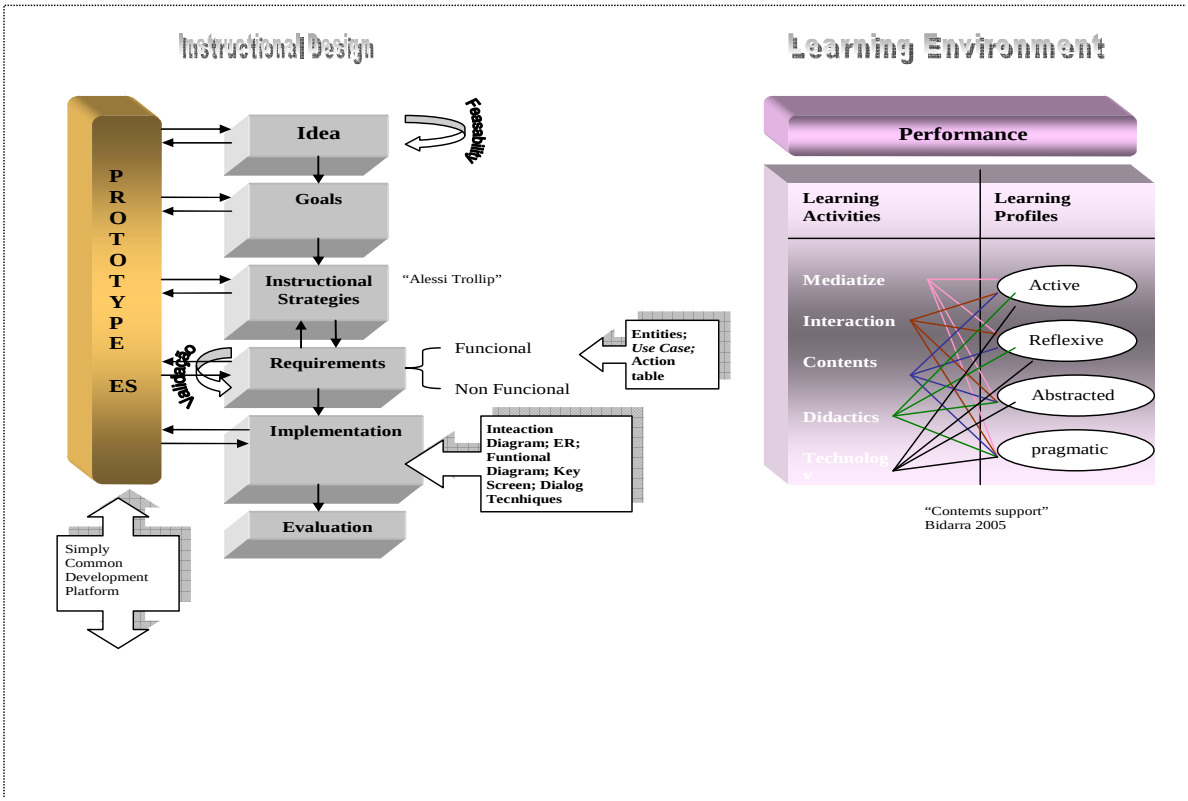

Fig 1: The X-TEC conceptual model

The X-TEC lifecycle is mainly supported on three major activities:

Cognitive (Knowledge) - mental skills where the brain must be used to perform intellectual tasks.

Affective (Attitude) - best described as making a commitment - just because we know something, does not mean we will act upon it.

Psychomotor (Skills) - physical skills where the body must coordinate muscular activities (some are minor, such as turning a dial with your fingers).

Educational System Architecture

The X-TEC model is supported by a three tiered architecture [Eckerson 95]: User Interface, Rules and Information Repository, according to fig.2.

The three tier architecture is used to provide increase performance, flexibility, maintainability, reusability and scalability, while hiding the complexity of distributed processing from end user.

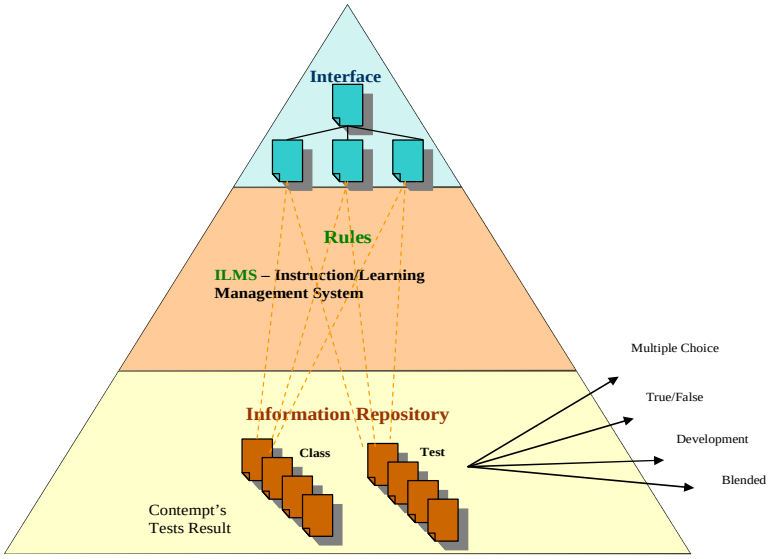

Fig 2: The X-TEC architecture

1st Tier: Interface
Is related with the scenario identification, synchronous and asynchronous communication technologies and implicit and explicit messages
This tiers main actors are: Educational Software; Content Specialist's and Designers.

2nd Tier: Rules
Is related with the virtual abstracted organization of the content
The main actor, on the Rules tier, is: ILMS – Instruction/Learning Management System.

3rd Tier: Information Repository
It will allow all the contents, rules and interface specifications being stored on a warehousing platform.

Conclusion

X-TEC model is supported by software engineering goals, principles and actions [Pressman, 2001], [Bates, 2000]. In particular, the model is appraised for:

- Reusability: How well the model is suited to creating, as well as incorporating, reusable components into its execution.

- Testability: Each stage deliverables are evaluated as to how well they are suited for use in a testing process.

- Modifiability: The degree to witch educational software product generated using the model is evaluated. In particular, the degree of object coupling allowed in the model is determined. If the degree of coupling allowed is unconstrained, then the method provides poor modifiability.

- Conceptual Integrity: Conceptual integrity is a measure of degree to which the models remain true to the concept of “objects”.

- Access: How accessible is a particular technology for learners? How flexible is it for particular target group?

- Cost: What is the cost structure of each technology? What is the unit cost per student?

- Teaching and Learning: What kinds of learning are needed? What instructional approaches will best meet these needs? What are the best technologies supporting this teaching and learning?

- Interactivity and user-friendliness: What kind of interaction does this technology enable? How easy is to use?

- Organization and user-friendly: What are the organizational requirements, and the barriers to be removed, before this technology can be used successfully? What changes in organization need to be made?

- Novelty: How new is this technology?

- Speed: How quickly can courses be mounted with this technology? How quickly can materials be changed?

This study is the first step towards creating a standardized model for the development of educational materials based on results.

It is our ultimate goal to train a workforce of talented educational designers, equipped with the fundamental skills to effectively undertake any problem in educational systems design.

We will go in depth with the process of creating a model that allows developers of educational software to reduce the gap between instructional design and technical development.

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