

Toward a virtual learning environment based on Agile learner-centered design

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Abstract—This paper presents a case of study of a virtual learning environment based on Agile Learning Design approach and integrating learner-centered design. It aims to give the foundation of a framework that gives extensive attention at each stage of the design process to the end user –which is in our case the learners- to improve teaching effectiveness, facilitate learning among learners, encourage long life learning and maximize motivation as well as reducing the dropout rates.

Keywords : *Virtual Learning Environment, Agile Learning Design learner-centered design, learning motivation.*

I. INTRODUCTION

VLE is the most used educational technology that offers countless prospects to support online learning and training, especially in higher education. Furthermore, the most VLEs provide instructional content that can be specifically tailored to meet different learner profiles.

One of the challenges faced by developers of VLEs has been how to design and create quality and pertinent VLEs, able to build courses based on a model of the goals, preferences and knowledge of an individual user and use this throughout the interaction for adaptation to the needs of that user. This is due to the fact that VLEs deal with diverse backgrounds, such as software developers, web application experts, content developers, domain experts, instructional designers, user modeling experts, pedagogues, etc. [1].

Moreover, the process of defining and developing e-learning material for a VLE is often expensive to produce - especially in a single context setting- making the return on investment difficult to quantify [2].

The most of VLEs currently available provide similar sets of features. The most of them are designed and developed from scratch, without taking advantages of the experience from previously developed applications, because the latter's design is not codified or documented [3]. Thus, development teams are wasting time and efforts to reinvent the wheel.

The design of VLEs was subject of various works in the literature [2][3][4][5][6]. Thus, there are several learning

design methods presented in the literature, such as ADDIE, OULDI, Design thinking, Xproblem, etc. However, the most of them don't involve the learner until late in the project which is in our view an obstacle for the adaptation of the content to the features of the learner and leads to the dropout.

In this work, we focus on one of the recent works proposed to design VLE, which is called Agile Learning Design. This choice is based on a comparative study of the most used approaches in the literature that was subject of other publications [7][8]. A learner-centered approach -that is increasingly being encouraged in higher education- will be implemented to Agile Learning Design process to involve the learner in each stage of the design process.

The present work aims to present a framework for designing VLEs based on Agile Learner-centered approach. The rest of this paper is structured as follows. The second section provides an overview of the concepts learning design, Agile learning design and learner centered approach. The third section describes a case study based on Agile Learning Design approach and integrating the learner centered approach. The fourth section provides discuss of the preliminary results of this work. Finally, a conclusion and future work are presented in the last section.

II. BACKGROUND AND RELATED WORK

In this section, we present first an overview of the concept of Learning Design. We provide afterwards a summary of Agile Learning Design and learner-centered design.

A. Learning Design

Historically, Learning Design has emerged from instructional design, but with a focus on learning activity as the central concern of the design process [9]. It was presented as a methodology for both articulating and representing the design process and providing tools and methods to help designers in their design process [10].

Koper [11] defines the Learning Design as the description of the teaching-learning process that takes place in a unit of learning (eg, a course, a lesson or any other designed learning event). Other authors [9] use the term "Designing for Learning" which is defined as The process by which teachers

– and others involved in the support of learning – arrive at a plan or structure or design for a learning situation.

Learning design representations enable teachers to document, model and share teaching practice at various levels: from the creation of a specific learning activity, through the sequencing and linking of activities and resources, to the broad curriculum and program levels.

B. Agile Learning Design approach

The Agile Learning Design is an iterative model of learning design that focuses on collaboration and rapid prototyping. Agile Learning Design can be adapted to fit the needs of the learning and training community by providing an ethos for the design of learning [12].

The flow of agile Learning Design may contain several cycle Fig.1 (see below). Each cycle consists of problem analysis in the first phase, followed by the development of a single feature of the final product. Once this single small part of your course is finished you can start testing and evaluating the efficiency and the return on investment of this part. If the results are satisfying a new iteration begins, until the course or the project are fully finished, otherwise the designer has to take one step back, understand what went wrong, and correct.

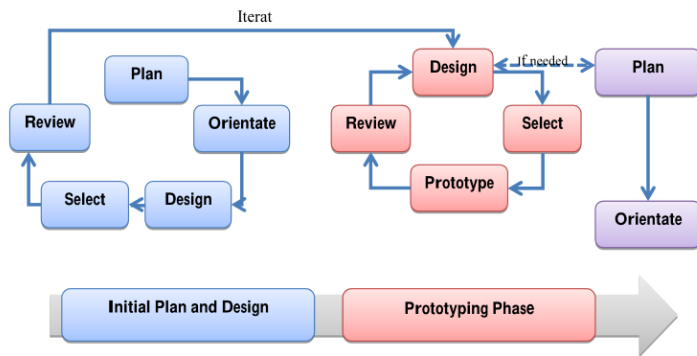


Figure 1. The flow of Agile Learning Design

In the literature, we find a variety of agile design practices. Each of these practices is important, and each is needed. The agile practices are combined with Learning Design, assisting and guiding the design and creation of learning environment [13]:

- Active users participation* : Users are involved in the development process, helping to identify and solve problems and mistakes and providing rapid feedback to the team
- Collaborative development*: All team members constantly interact and communicate throughout the development process, promoting a collaborative and productive environment
- Architecture/Design envisioning*: Initial software architecture and requirements are designed at the beginning of a project to identify and think through critical issues

- Iterative modeling/ design*: Software functionalities are designed at the beginning of an iteration to identify team's strategy for that iteration
- Model/ Design storming*: Software functionalities are designed on a just-in-time (JIT) basis to reflect on specific aspects of team's solution
- Early and continuous Evaluation*: Testing and validation activities are conducted at the beginning of the project and extend throughout the development process

In the literature, several Agile methods have been presented and developed. Below some of them:

- Extreme Programming (XP) by Beck, 1999, 2000
- SCRUM by Schwaber and Beedle, 2001
- Crystal Methods by Cockburn, 2001
- Feature-Driven Development (FDD) Felsing, 2002
- Lean Software Development (LSD) 2003

C. Learner-centered approach

The learner centered approach involves methods of teaching that move the emphasis of teaching from the instructor and contents to the learner. In the literature, the terms “Learner-centered”, “learning-centered teaching” or “student-centered learning”, are commonly used to design this approach. The term “learner-centered” will be used through this work even if some authors use the other terms.

Several authors [14][15][16] when the focus becomes learner higher rates of student retention is attained and have better prepared graduates than those students who were more traditionally trained.

Moreover, Mattheu[17] claimed that adopting learner centered approach, learners are proactive independent, responsible for both what they learn and how they learn. The course provides a flexible framework, supportive environment and collaborative learning culture, with faculty guiding learners through their learning as mentors, with the focus on developing students' critical thinking, problem-solving and research skills. This enables them to become effective life-long learners.

The learner-centered approach provides much benefit, below the most cited in our readings:

- Enables personalized learning and Advances participation* : traditional online courses treat all learners in the same way, and could not react to the different features of learners. Adopting the learner-centered approach, additional materials are included to ensure personalized and convenient contents and thereby enhance participation.
- Increases retention of knowledge*: The learner-centered approach shifts the emphasis from traditional Learning to Learning with more engaging and simulating content.
- Improves problem-solving skills*: the contents may have tests and games relating real life problems, which will lead learners to think and search of solutions.
- Encourages collaborative learnin*: the learner-centered approach encourages learners to work

together to solve problems, share learning and fosters teamwork.

III. A CASE OF STUDY : ALC-PROMA

In this section, we illustrate some features of our VLE called project management course based on Agile Learner-centered approach (ALC-PROMA).

A. The Design of ALC-PROMA

The agile Learning Design method used to implement the ALC-PROMA is organized in four phases (Plan Develop, Test and validate). We notice that we use the same phases to design all the components of the ALC-PROMA

1) *Establish the initial content of the VLE:* In this stage, we use as a starting point, an architectural design of the proposed system which is composed by three main components Fig. 2.

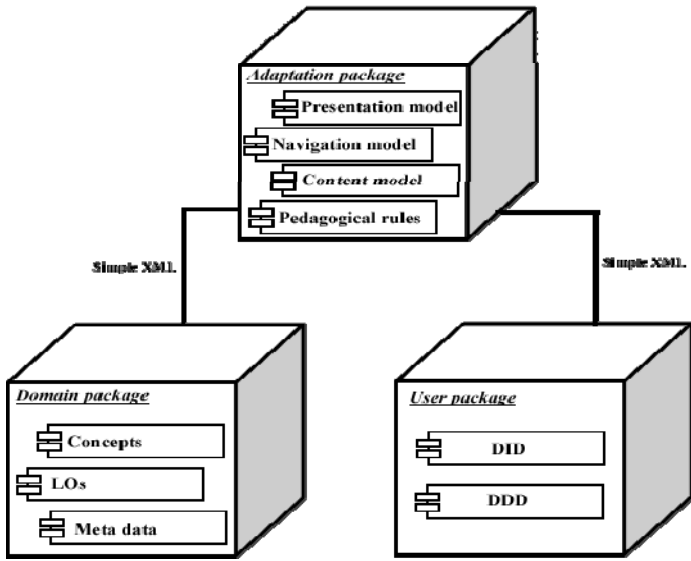
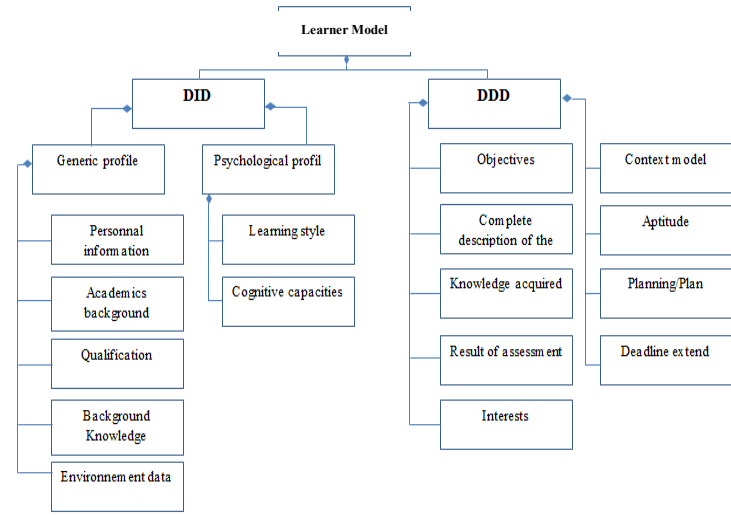


Figure 2. ALC-PROMA architecture

In the following, we present these components, their descriptions, their features and interactions between them

- The domain package:* The domain package is characterized by its competence in terms of representation of concepts to learn, the resources available to learners and the structuring of various elements of the field.
- The learner package [1]:* The learner package allows changing several aspects of the system, in reply to certain characteristics (given or inferred) of the learner. It includes two type of information grouped in two domains (1) **Domain Independent Data (DID)**: data related to two elements: the Psychological Model and the Generic Model of the Student Profile, with an explicit representation. (2) **Domain Dependent Data (DDD)**: information referring to the specific knowledge the system judges the user possesses on the domain Fig. 3



- The adaptation package:* The adaptation package deals with the generation of adaptive content that will be subsequently presented to the learner. This component has four sub components: the navigation model, the presentation model, the content model and the pedagogical rules. Each sub-component contains a set of rules to achieve the adaptation.

After specifying the initial requirement and the main components of our system, every component was subject of a series of iterations, analyzing, designing, developing and testing each feature in turn.

In the stage of testing we focused on remarks and feedbacks of learners. We collect all information that could be used to improve the succeeding sprint and to contribute to the constant enhancement process.

All data used in all stage, was collected through survey or meeting.

IV. SOME RESULT AND DISCUSS

The first version of the framework presented in previous section, has already been implemented and tested to validate the proposed approach with some selected learners. As we work in faculty, we can't work in the stage of the design with much learner.

For the first version of the system we highlight that the Agile Learning Design method allows designs to be modified, repurposed and evolved according to the needs of learners emerging during development. In terms of the applicability of the method, the preliminary results indicate that the method is useful, easy to use. Furthermore, it focuses on the final client which is in our case the learners and their interactivity with the system

Another result is the human contact with the students, they have not been considered without knowledge but rather partners who participate in the improvement of the system. This motivated them to give their best and develop further learning in the discipline.

V. CONCLUSION AND FUTURE WORK

In this paper we proposed a general view of how to support de design and the implementation of a VLE respecting the Agile Learning Design method and integrating the learner-centered approach. First, we expose the interest of integrating the learner-centered approach and using the Agile Learning Design. Furthermore, we present the preliminary results showing the success of this approach in designing and implementation of the components of VLE.

We intend to complete our system and to enhance our proposal based on the results of the experiment and on the feedback from learners. For further validation, we plan to embed more students on the experiment of the all components of VLE, enhance our proposal based on the results of the experiment and on the feedback from students.

Actually, we are working on improving the system and including more contents and materials that makes learning more effective.

REFERENCES

- [1] A. Battou, O. Baz, D. Mammass, "Toward a Framework for Designing Adaptive Educational Hypermedia System Based on Agile Learning Design Approach", Europe and MENA Cooperation Advances in Information and Communication Technologies Volume 520 of the series Advances in Intelligent Systems and Computing pp 113-123 (2016)
- [2] M. Alshawi, J. Steven Goulding, I. Faraj, "KnowledgeBased Learning Environments for Construction", Journal for Education in the Built Environment, 1:1, 51-72 (2006)
- [3] R. Retalis, A. Papasalouros, A. "Designing and Generating Educational Adaptive Hypermedia Applications". Educational Technology & Society, 8 (3), 26-35. (2005).
- [4] M. Grigoriadou, K. Papanikolaou, H. Kornilakis, G. Magoulas, "INSPIRE: An Intelligent System for Personalized Instruction in a Remote Environment". In P. D. Bra, P. Brusilovsky, & A. Kobsa (Eds.), Proceedings of Third workshop on Adaptive Hypertext and Hypermedia, July 14, 2001. Sonthofen, Germany, Technical University Eindhoven. - pp. 13-24 (2001).
- [5] M. K., Stern, B. P. Woolf, "Adaptive content in an online lecture system", In P. Brusilovsky, O. Stock, & C. Strapparava (Ed.), Adaptive Hypermedia and Adaptive Webbased systems (pp. 225-238). Berlin: Springer-Verlag. (2000).
- [6] C. Süß, R. Kammerl, B. Freitag, "A teachware management framework for multiple teaching strategies", In J. Bordeau, & R. Heller (Eds.), Educational Multimedia/Hypermedia and Telecommunications, 1998, Proceedings of EDMEDIA'2000 - World Conference on Educational Multimedia, Hypermedia and Telecommunications, June 26 - July 1, 2000. Montréal, Canada, AACE. (2000).
- [7] A. Battou, O. Baz and D. Mammass. "Learning Design Approaches for Designing Virtual Learning Environments". Communications on Applied Electronics 5(9):31-37, September 2016
- [8] A. Battou, O. Baz and D. Mammass. "Learning Design Approaches for Designing Learning Environments : A comparative study". 5th International Conference on Multimedia Computing and Systems – IEEE Conference . October (2016)
- [9] H. Beetham, R. Sharpe. "An introduction to Rethinking Pedagogy", Rethinking pedagogy for a digital age : designing for 21st century learning -2nd edition 2013, pp. 26-35.
- [10] G. Conole, "An overview of design representations", Proceedings of the 7th International Conference on Networked Learning 2010, Edited by: Dirckinck-Holmfeld L, Hodgson V, Jones C, de Laat M, McConnell D & Ryberg T.
- [11] R. Koper, "Current Research in Learning Design", Educational Technology & Society, 9(1) 2006, pp.13-22
- [12] D. Clark, "Agile Learning Design: An Ethos for Creating Learning, Training, and Performance Processes", September 2015.
- [13] M.M. Arimoto, L. Barroca, E. F. Barbosa, "An agile learning design method for open educational resources". IEEE Frontiers in Education Conference Proceedings, IEEE, pp. 1897–1905, 2015.
- [14] P. Blumberg, "Developing Learner-Centered Teachers: A Practical Guide for Faculty". San Francisco: Jossey-Bass. 2008
- [15] M. W. Matlin, "Cognitive psychology and college-level pedagogy: Two siblings that rarely communicate". In D. F. Halpern, & M. D. Hake (Eds.), Applying the science of learning to university teaching and beyond. (pp. 87-103). San Francisco: Jossey-Bass 2002
- [16] R. J. Sternberg, E. L. Grigorenko, "The theory of successful intelligence as a basis for instruction and assessment in higher education". In D. F. Halpern, & M. D. Hake (Eds.), Applying the science of learning to university teaching and beyond [The theory of successful intelligence as a basis for instruction and assessment in higher education] (pp. 45-54). 2002.
- [17] S. Mattheu, "A Proposal for an Agile Approach to the Teaching and Learning of Creative Technologies". A dissertation submitted to Auckland University of Technology in partial fulfilment of the requirements for the degree of: Bachelor of Creative Technologies 2013.
- [18] P. Brusilovsky, "Integrating hypermedia and intelligent tutoring technologies: from systems to authoring tools", In P. Kommers, A. Dovgiallo, V. Petrushin, & P. Brusilovsky (Eds.), New media and telematic technologies for education in Eastern European countries (pp. 129-140) (1997).