Lean and Agile Practices linking Engineering Higher Education to Industry

Background

Higher education prepares learners for their future role as professionals and active citizens in multiple ways. According to the Modernization Agenda for Higher Education, the sector faces multiple challenges in its quest to build critically thinking, creative, and adaptable adults (Vassiliou A.); these include the economic crisis, youth unemployment, integration of new technologies and modes of working, and more. On the other hand, the Communication on Opening-up Education highlights the need to stimulate innovative ways of teaching and learning through new technologies and digital content, to alleviate the "new digital divide" which has led to 50-80% of students never using digital content, and to exploit the opportunities of the digital revolution in educational contexts.

In engineering principles, the knowledge students build while enrolled in higher education may become to a large degree irrelevant a few years after graduation as a result of the fast evolution of technology in innovation related sectors. In this context, the capacity to think critically and to learn-to-learn are as important, if not more, as the base knowledge developed through formal curricula. In addition, to facilitate an effective transition to the professional world higher education must expose students to industry practices and processes rather than be limited to the development of core knowledge. This exposure may be achieved to a certain degree through specific courses; more effectively, it may be achieved through the integration of industry processes into curricula thus enabling students to use new skills and competencies in a learning environment that simulates the way industry deploys knowledge.

LEAP Overall Objective

LEAP aims at building experience and knowledge among higher education students on emerging lean and agile industry practices empowering them to effectively transition into the professional world, focusing on engineering disciplines. The project further aims at closing the new digital divide by promoting the development of high quality digital content for higher education linked to both academic and industry needs. Lean practices will encourage students to design solutions that meet needs while minimizing the deployment of resources. Agile practices expose students to industry cycles in which design is integrated throughout production processes, as opposed to only in the early stages of production, ensuring that the final product effectively addresses consumer needs.

LEAP deploys serious games that encourage learners to adopt industry roles, to think critically for addressing community and societal needs through agile engineering solutions, to practice on the application of industrial process management in the context of their higher education curricula, and to take into account environmental responsibility issues in service design and implementation. Recognizing the importance of supporting educators on integrating the proposed innovative learning methods and tools into their teaching practices LEAP will further develop good practice guidelines and instructor support content.

Outcome

- A lean and agile learning design framework that encourages students to think critically for building engineering solutions that effectively address user needs while taking into account environmental issues
- Proof-of-concept serious games based on scenarios that challenge learners to introduce solutions to real-world issues through engineering innovation
- Educators support content for facilitating the integration of proposed methods and tools into existing instructional practices
- Good practice recommendations for promoting uptake and adoption of project results based on evaluation findings

The LEAP learning game is being developed in the form of 3 learning applications that promote the development of agile and lean skills. The following games are under development:

- *The Technical Debt game*
- *The 5S Lean Processes game*
- *The SCRUM Agile Processes simulator game*

Innovation

In terms of Educational Objectives:

a) the need to align higher education practices to industry needs by updating higher education practices with initiatives that exposed students to industrial processes, such as agile and lean production design

b) the need update higher education practices through technology designed for educational use, such as serious games, with the objective of bringing higher education into the digital era

c) the need to develop open digital educational resources for free use at the higher education level for free use in formal and informal learning contexts

The Technical Dept game

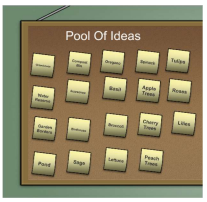
The 5S Lean Processes game

At the pedagogical design level:

The project introduces an agile, collaborative learning design approach. Agile product and service design is highly relevant in industry, and more so in software engineering, for ensuring that products and services address effectively the needs of end users and society. Agile design refers to product development in cycles of design, implementation, and evaluation phases; design is revisited several times throughout product development for enhancing the product characteristics based on input from end users. This approach ensures that the final product will more effectively address real world needs. In educational contexts, agile learning refers to the design of learning activities that follow industrial agile product and service design processes.

At the technology-enhanced level:

In terms of technical implementation, LEAP will validate the proposed learning methodological design described above through the design and software implementation of a serious game environment in which learners will be encouraged to design and synthesize solutions that address specific world needs. Learners will be encouraged to follow agile and lean product design through a serious game that simulates real-world industry processes and exposes learners to innovative thinking mindsets related to deploying technology for addressing specific needs of users in a human-centered solution as well as minimizing production costs through lean processes that conserve resources and respect the environment.



The SCRUM Agile Processes simulator game

Innovation at the learning intervention level:

- LEAP promotes active learning by doing, which has been seen to significantly contribute to knowledge retention (FAS)
- It links gaming to specific learning objectives through scenarios that are inspired by real-world work practices
- It contributes to linking learning activities to desired learning outcomes through immediate feedback
- It promotes knowledge transferability to other subjects through role playing and critical thinking, which is an inherent part of agile design
- It encourages entrepreneurial mindsets which are directly linked agile industrial practices that are inherently user-centered
- It promotes long-term engagement with learning through applications that attract and retain the interest of students

Project Partners

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