

Roadmap to PLE: A Design and Development Route to Empower the Use of Personal Learning Environments (PLEs)

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Abstract. In this position paper we argue that in order to design, deploy and evaluate institutional Personal Learning Environments, a system-level Roadmap should be developed accounting for the progressive expansion towards the following evolutions directions: from closed (VLE) to Open Learning Environments (OLE); from the individual-group, to individual-network and individual-collective relations; from using structured learning resources to using any type of content; from being instructor/institution-led by being self-regulated and self-managed; from being aimed at learning in the university system to supporting work-based learning; from being centered around web 2.0 to being empowered by web 3.0 tools and technologies. In order to accompany the development of such a Roadmap, an operational definition and hexagonal model of the PLE is presented in this paper together with its three-steps evolutionary process.

Keywords: Personal Learning Environment, PLE model, Virtual learning Environment, hexagon model

1 Introduction

Technology Enhanced Learning (TEL) is expected to address some of the main educational challenges of the next decade [1], [2]:

- creating learning environments that promote active learning, critical thinking, collaborative learning, and knowledge creation;
- developing 21st century literacies among students and faculty;
- reaching and engaging today's learner;
- connecting learners;
- orchestrating learning;
- encouraging faculty adoption and innovation in teaching and learning with IT;
- advancing innovation in teaching and learning with technology in an era of budget cuts.

However, since technological development and adoption go faster than its experimentation, evaluation and maturation in education, it is very difficult for Higher Education (HE) institutions to consolidate best practices in TEL domain and to refer to them when starting innovative educational approaches.

At present, in the third decade of the Web, most of European HE institutions have successfully managed to implement a technology usage in education (i.e. setting up the needed infrastructure, services, teachers' and students' training) [3] [4] primarily exploiting the affordances of the "Web 1.0", also known as "the Web of documents". Still there is a limited use of effective online interaction, participation and collaboration in learning, which are the affordances expected from the "Web 2.0", or the "Social Web" and a very limited use of intelligently matching learning content, people and services which are some of the main affordances expected by the "Web 3.0", or the "Social Semantic Web"¹.

To face this changing scenario some HE institutions have very recently started to reason about the possibility to set up and/or update "traditional" institutional technology-enhanced learning environments, typically known as Virtual Learning Environments (VLE), or Learning Management Systems (LMS) [5] with more flexible, open, customizable learning environments often referred to as *Personal Learning Environments (PLE)* or *Personal Learning Networks* [6]. Scholarly studies in the domain have started only recently but the interest around this concept is growing steadily as it is witnessed by two major events occurred in 2010: the PLE conference [7] held in Barcelona, in July 2010 and the PLE/PNE Massive Open Online Course [8] jointly organized by the National Research Council of Canada, the Athabasca University and the University of Prince Edward Island].

Most of currently available PLE definitions hinge around the following elements: "the term personal learning environment (PLE) describes the tools, communities, and services that constitute the individual educational platforms learners use to direct their own learning and pursue educational goals" [9]. A PLE is frequently contrasted with a Learning Management System (LMS) in that an LMS tends to be course-centric, whereas a PLE is learner-centric. At the same time, a PLE may or may not intersect with an institutional LMS, and individuals might integrate components of an LMS into the educational environments that they construct for themselves" [9].

A number of key research questions [10] overarch the issue of PLEs, crossing technology methodology and organizational boundaries.

Current Higher Education initiatives in designing, developing, using and evaluating PLEs for teaching and learning often address research questions related to what we could simplistically divide into two research mainstreams:

- 1) Technology mainstream: what components/tools/applications are to be integrated into a PLE?
- 2) Education mainstream: what pedagogies are suitable for PLEs?

¹ Web 1.0 and We 2.0 are used as synonymous of "Web of Document" and "Social Web" respectively while the term Web 3.0 is referred to the expected capability of the next Web to be at the same time social and semantically-enriched and encompasses the "Web of Data" and the "Semantic Web" approaches.

However, the separation of disciplinary research approaches limits the system-level perspective on the PLEs issues and do not account for all the grounding elements of a “Technology Enhanced Academy” strategy [11] ideally depicted in Fig. 1.

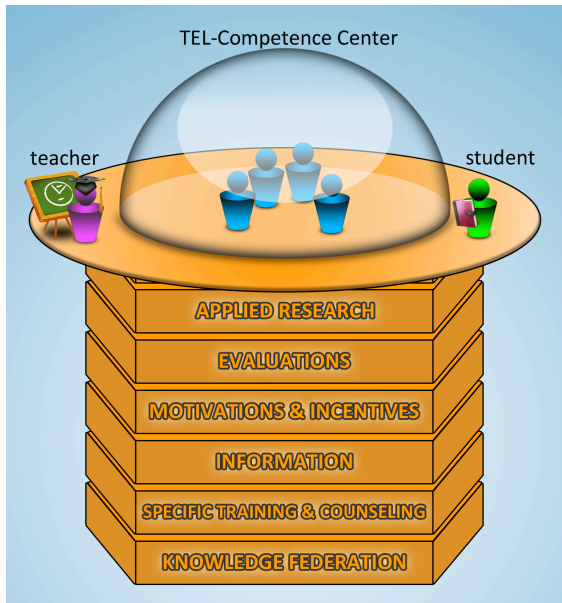


Fig. 1. A Technology Enhanced Academia builds on institutional strategies implemented by an Academic Competence Centre [11].

2 The Need of a System-Level Roadmap

In this position paper we argue that in order to design, deploy and evaluate institutional Personal Learning Environments a system-level, a PLE Roadmap should be developed accounting for the progressive expansion towards the following evolutions directions:

- from closed (VLE) to open Learning Environments (Open Education);
- from the individual-group, to individual-network and individual-collective relations;
- from using structured learning resources to using any type of content;
- from being instructor/institution-led by being self-regulated and self-managed;
- from being aimed at learning in the university system to support work-based learning;
- from being centered around Web 2.0 to being empowered by Web 3.0 tools and technologies.

However, in order to follow such a Roadmap, a set of key research questions should be addressed:

- 1) What are the implications of PLEs on traditional modes/structures of education?
- 2) What are the key attributes/components of an effective PLE?
- 3) How can we evaluate subjective and objective learning outcomes?
- 4) What pedagogies are inspired by PLEs (e.g., networked learning, connected learning)?
- 5) How can we understand, use and engineer evolutionary (semantic) Web technologies for an effective and truly personalized learning in PLEs?
- 6) What kind of Personal Learning/Knowledge Management skills do we need as teachers/learners?
- 7) Can we start thinking beyond PLE bridging educational technology into the classroom toward workplace and professional learning?

3 The PLE Hexagon Model

Since concrete design implementation and evaluation of PLEs requires a more operational definition, we define the PLE as “the deployment of a Personal Web (WHERE) used to build knowledge in relation to specific learning-goals (WHY), in a time dedicated to learning (WHEN), centered on a user/learner and connected to other users (WHO), allowing to realize a personalized view of the learning flow (WHAT) provided it is used with proper competences and method (HOW)” (see Figure 2).

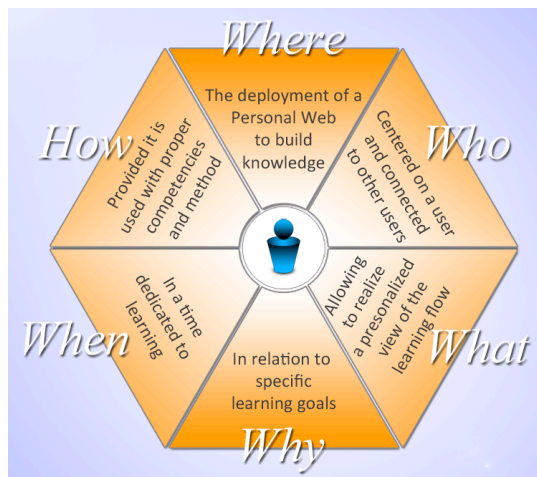


Fig. 2. The PLE hexagon model.

Such definition goes beyond current state of the art of PLE definition and representation that either a) tend to focus mainly on its technological dimensions of a multi-tools environments [12][13] or b) provide high-level perspectives on PLE but

do not provide concrete operational elements to guide its design, development and evaluation [14] [15] [16].

The PLE model here proposed accounts for a richer set of dimensions describing also methodology, users skills, context elements and instructional goals/types.

The coherent evolution of the above six dimensions should be at the heart of the strategy and Roadmap being set up for the purpose of designing, developing and implementing an institutional PLE.

4 The PLE Roadmap: a 3 Steps Process

The coherent evolution of the PLE hexagon model inspires the research Roadmap to the academic adoption of Personal Learning Environments organized around 3 main milestones of the PLE Roadmap (see Figure 3):

- 1) basic,
- 2) intermediate and
- 3) evolutionary.

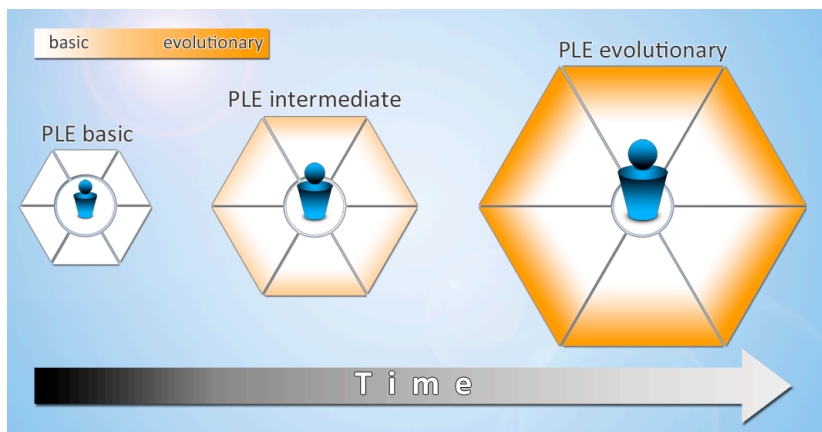


Fig. 3. Three-steps PLE Research Roadmap.

4.1 PLE Hexagon Dimensions

The institutional PLE adoption related to the three different degrees of evolution shown in Figure 3 are aimed at supporting the users' empowerment in self-regulation and self-managed learning skills. Hereafter we detail the six hexagon dimension with respect of the main characteristics they should possess according to the three evolution steps.

4.2 Where

This dimension is related to technological infrastructure, tools, services, and applications. It is conditioned to the transitions from Web 1.0, Web 2.0 towards Web 3.0 The evolution of this technological [17] dimension is to be taken at a design level. To this end, the three dimensions are defined as to provide incremental basic support to social-semantic technologies.

Table 1. WHERE

Basic	It is mainly centered on: a) semantically-enabling the existing VLE infrastructure (i.e. repositories and Virtual Learning Environments (VLEs) that import and export their data using semantic technologies; b) repositories for scientific resources that can expose metadata in RDF; and c) infrastructural tools and services that enable exposing databases or integrating data sources within or across organizations in interoperable (semantic) formats.
Intermediate	It is centered on the integration of the basic PLE with: a) institutional social networks that will include semantic-enhanced technology tools and applications (e.g. collaborative authoring and annotation tools, including semantic wikis and argumentation tools); (e.g. semantic wikis) b) the academy administrative services (calendar, exams, user registrations, etc.).
Evolutionary	It is centered on the development of a set a fully customizable widgets that will allow to personalize the access to the different educational flows, will allow the self-management of both the formal and informal educational activities as well as semantic-based intelligent support to personalized learning services (e.g. recommending relevant content and people, supporting contextualized searches; supporting group formation for collaborative work, providing argument visualizations and linking relevant discussions, etc.).

4.3 Who

This dimension is related to the different levels of connections and “presence” (social², cognitive³ and teacher⁴) in the online learning settings as detailed in [18] [19] [20].

² Social presence is described as the ability to project one’s self and establish personal and purposeful relationships. The three main aspects of social presence, are effective communication, open communication and group cohesion [18].

³ Cognitive presence is defined as the exploration, construction, resolution and confirmation of understanding through collaboration and reflection in a community of inquiry [18].

⁴ Design, facilitation and instruction direction [18].

Table 2. WHO

Basic	The main relational dimensions hinge around Individual & Group. In this context the two kind of presences to be sustained are: Teacher-presence and Cognitive-presence
Intermediate	The main relational dimensions hinge around the Networks In this context the three kinds of presences to be sustained valued are: Cognitive-presence Teacher-presence Social-presence
Evolutionary	The main relational dimensions hinge around the Collectives In this context the three kinds of presences to be sustained valued are: Social-presence Cognitive-presence Teacher-presence

4.4 What

This dimension is related to main type of contents and resources accessed in the knowledge construction processes.

Table 3. WHAT

Basic	Learning Objects and activities created/selected/provided/ by the teacher.
Intermediate	Open Educational Resources (OER) [21] and Web resources evaluated and organized in meaningful sequences and activities by the teacher
Evolutionary	Web resources self-discovered and and/or discovered and organized by the intelligent support system.

4.5 Why

This dimension is determined by the context of the learning/knowledge processes and it is related to objectives and motivation of the PLE users.

Table 4. WHY

Basic	Accreditation of the formal curriculum
Intermediate	Increasing learning effectiveness Personalize learning
Evolutionary	Life Long Learning

4.6 When

This dimension is related to the time and regulation of the knowledge process (self-directed vs teacher-directed).

Table 5. WHEN

Basic	Academic calendar
Intermediate	Self-regulated within the institutional calendar
Evolutionary	Fully self-regulated learning [22]

4.7 How

This dimension is related to a) the methodology enacted to facilitate learning both from the teacher's perspective and from the student's perspective b) the effectiveness of the learning outcomes.

Table 6. HOW

Basic	Instructional Design Theories (ID)
Intermediate	Basic e-competencies/skills [23]
Evolutionary	Self-regulated Learning & Higher Order e-competencies [23] [24] [25]

5 Conclusion

The PLE - (Personal Learning Environment) can be seen as a scalable evolutionary Technology-Enhanced window mediated by Higher Education institutions towards Work-based Lifelong Learning. The "Roadmap to PLE" presented in this paper is rooted in the *PLE hexagon model* which is conceived to be used as a flexible and operational tool to support the design, implementation and evaluation of institutional PLEs. The "Roadmap to PLE" proposed in this paper provides a simplified path organized around three main steps: basic, intermediate and evolutionary, aiming at highlighting the need of designing an incremental system-view of the PLE accounting of all the dimensions of the PLE proposed model.

Even if this conceptual approach has not yet been implemented and evaluated in institutional settings, state of the art literature can be accounted for within such conceptualization in order to highlight its coherence at a system level.

Indeed, design and preliminary implementations of institutionally based PLEs confirm the need of such a system approach. This is witnessed by the work in progress carried out respectively at the Learning Societies Lab, ECS, University of Southampton, UK [26] and at the National Research Council of Canada [27] [28]. Other empirical preliminary researches pinpoint that design and implementation of institutionally based PLE suffers from limitations provided by a techno-centric design

perspective and highlight the importance of dimensions such as methodology, e-skills and competencies, self-regulation [29] [30] [31] [32].

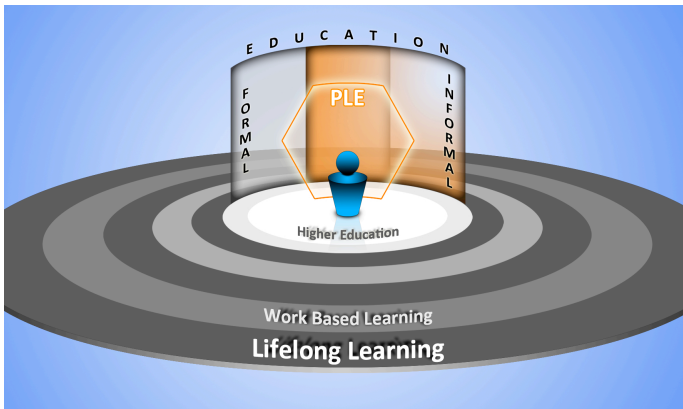


Fig. 4. The PLE: a scalable evolutionary Technology-Enhanced window for Higher Education towards Work-based Lifelong Learning

The concept defended in this paper leverages on the fact that the design, practical implementation and evaluation of Personalized Learning can be operationally supported by the coherent evolution of the six dimensions proposed in the PLE hexagon model. Such a process can be intermediated by Higher Education Institutions, which undertake the educational goal of “supporting individuals (and groups) in gaining awareness and control over a range of intentional learning activities and their environments, and eventually their overall development as personal (adult) learners living in (and not only with) the digital realm”. [16]

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