

# Personal Learning Environments

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## Abstract

*Personal Learning Environments (PLEs) are attracting increasing interest in the e-learning domain. However, the term Personal Learning Environment is used in a variety of different ways in the field. This paper firstly draws distinctions between the term PLE and similar terms. It then discusses the dimensions which characterise current conceptions of PLEs, thereby defining a space of PLEs. Three examples of Personal Learning Environments are provided to show different PLE positioning in the PLE space.*

## 1. Introduction

Personal Learning Environments (PLEs) are a relatively new phenomenon in the e-learning domain, motivated by:

- The needs of life-long learners who need to have a system that interfaces to different institutional e-learning systems. This need is in part predicated on requirements to maintain portfolio information across different institutions, and to insulate individual users from the need to learn to use different institutional e-learning systems.
- A response to an increased perception that Virtual Learning Systems (VLEs) and Learning Management Systems don't deal as well as they could with the needs of learners. In part, some of this perspective is motivated by a view that e-portfolios have become institutional instruments that largely record achievement and do not support some envisioned portfolio-based activities, e.g. reflection.
- A response to issues of control, according to pedagogic approaches which require that learner's e-learning systems need to be under the control of the learners themselves; a concept which is generally alien to institutional VLEs.

- The needs of learners who sometimes perform learning activities offline, without connectivity to a server which provides VLE facilities. This might happen inside a hospital where connectivity is hampered by the need to avoid radio transmissions, or in communication-impooverished environments, such as on a remote mountainside during a geological field trip, or in the countryside in a developing country.

As such, a PLE is a single user's e-learning system that allows collaboration with other users and teachers who use other PLEs and/or VLEs. In some sense a PLE must contain 'productivity' applications that facilitate the owner's learning activities. PLEs should be generally under the user's control as to use and personalisation. Some varieties of PLEs allow for off-line work to be performed.

An alternative definition is offered by Wilson [1]:

- "A PLE is a type of e-learning system that is structured on a model of e-learning itself rather than a model of the institution
- PLEs are concerned with the coordination of the connections made by the learner with units and agents across a wide range of systems
- PLEs are envisaged primarily as *open systems*"

However, ideas about PLEs are still forming. As an aid to the development of the PLE field, this paper discusses dimensions that form a space of PLEs, providing the basis of a taxonomy for current and future PLEs. Possible changes to the dimensions are anticipated as the field matures.

Section 2 discusses the term PLE and similar sounding terms, to help further define what a PLE is, and what a PLE isn't. Section 3 discusses the dimensions of a space of PLEs. Section 4 briefly mentions some related work on PLE definition. Section 5 gives examples of PLE implementations

(most of which are still under development). Finally, section 6 offers some conclusions.

## 2. Terminology

Some use of Personal Learning Environment is very general in scope and refers to *any* online environment for use by an individual. Typically these environments would be supplied using a VLE and a browser. Because the meaning of this term is both very general and yet weak in the meaning conveyed in this paper, and because the prevalence of this kind of environment is so common, it is suggested that the use of the term is of little value beyond the aggrandisement of particular learning environments for 'advertising' purposes. This general use is not considered further in this paper.

Similar sounding but more valuable descriptions are provided by Personalised Learning Environment, and Personalizable Learning Environment. It is suggested that these can supply useful distinctions regarding personalisation:

- A Personalised Learning Environment can usefully mean any environment that has been tailored for an individual prior to use.
- A Personalizable Learning Environment is one that can be personalised at the time of its use, either by the user or by the system on behalf of the user.

## 3. The dimensionality of the PLE space

The current use of PLE to describe different kinds of learning systems is drawn out here as a set of dimensions that characterise a space of PLEs. Clearly the field is still in development, and the dimensions offered here will be refined over time.

Not all the dimensions that follow are orthogonal. Where this is the case, interacting dimensions are identified.

### 3.1 Pedagogy, personalisation and control dimensions

**Philosophical background and pedagogic approach.** As with all e-learning systems, individual PLEs will be expressions of educational philosophy and pedagogic approaches. Clearly wide variation is possible on this dimension.

**Collaborative / non-collaborative.** Connected to the dimension above, this dimension indicates the extent to which users may collaborate in teaching and

learning activities, e.g., collaborative activities motivated by social constructivism [2]. Colloquia [3] is an interesting example that is built around conversations and collaborative activity.

**Open / closed.** An open system may be extended easily, a totally closed system may not be extended at all. This dimension influences personalisation. Openness is highly desirable, and can be implemented via a variety of mechanisms. At the most basic level this may be provided by facilities for users to capture and use URLs to obtain extra facilities. Some commentators are of the opinion that an open PLE can be constructed entirely from various kinds of servers on the web (e.g. elgg, flickr). However, application interoperation is a problem in this scenario. Another more complex mechanism, as yet unimplemented in any PLE, would operate by resource discovery and subsequent resource use in a service oriented architecture (see, e.g., the e-Framework [4]).

**Personalisation.** PLEs may be fixed in scope and functionality or may be extendable, preferably on an individual basis during their use. Unsurprisingly, proponents of PLEs are generally proponents of personalisation facilities.

**Locus of control and ownership.** There is increasing awareness of a major limitation in many VLEs, namely teacher or institutional control of resources. This is often manifested as limitations on who can set up activities and computer-mediated discussions. It is important for certain pedagogic approaches that the locus of control be appropriately shared between learners and teachers. Ownership of PLEs may be vested in learners and teachers and taken out of conventional institutional ownership. This has implications for the duration of PLE use, and for platforms on which PLEs are hosted.

### 3.2 Connectivity and compatibility dimensions

**Single / multiple institution connectivity.** If VLEs are to be used for lifelong learning then lifelong learners will require that their PLEs connect to multiple institutions and to suppliers of continuing professional development education. Without multiple institution connectivity PLEs will only support short term learning activities such as courses or individual institution's educational programmes. The use of standard communications protocols will facilitate this, and one could thereby envisage a 'Universe of PLEs' that interoperate with a variety of servers.

**Peer-to-peer / server-based.** Characterises the implementation of communications paths for learner-learner and learner-teacher communications, and to obtain data and applications to run on a PLE. PLEs may function as pure peer-to-peer systems, be server based, or be hybrid systems. What is important here is that users of PLEs will generally need to source materials for learning and extensions to their PLEs' functionality. These artefacts will generally be server supplied. Colloquia, despite often being represented as a peer-to-peer system, is a rich client for an e-mail system [5]. The Manchester PLE [6] is also server-based, where the server is also be a VLE.

**Package compatibility.** With the increasing adoption of e-learning standards, it is expected that package compatibility, e.g. the ability to use standard content packages, will strongly characterise future PLEs.

**Application compatibility.** In one sense this is only applicable if there is at least one VLE server acting as an application sever for PLEs, and if the architecture of the VLE server(s) and the PLEs allows the same applications to be run on both VLE(s) and PLEs. The Manchester Framework is specifically designed for application compatibility. Application compatibility will also apply if different kinds of PLEs run the same applications. This is unlikely to occur in the short term. However, there might eventually be different PLEs that use a common extension mechanism for applications, thereby allowing for application compatibility.

**Plugability.** Plug-ins are a specific and relatively closed (see above) extension mechanism. However use of this mechanism does not in itself indicate that a PLE is relatively closed; there may be other mechanisms to provide the property of openness. The Manchester Framework is pluggable via JSPs and servlets, and PLEX [7] is pluggable via Eclipse plug-ins.

**Online usage only / online and offline usage.** As discussed in section 1, it is of real value for a PLE to be usable off-line. Indeed, this is considered so important that some researchers would only consider that a system is a PLE if it is able to be used in both on-line and off-line contexts. The Manchester Framework supplies such a PLE.

## 3.2 Platform dimensions

**Dedicated rich client based / thin client (aka browser) based.** Rich clients allow offline use, and at the other extreme, browsers that use remote server(s) require online use.

**Light-weight platform / heavy-weight platform.** Desktop and laptop systems for clients are heavyweight hardware platforms for PLEs, whereas the use of PDAs and converged PDA-like devices are a particularly exciting lightweight approach to hosting PLE clients.

## 4. The PLE Reference Model

Current work at CETIS [8] is in part aimed at establishing a reference model for PLEs. This reference model will have the following components:

- Use cases – how may be used, and what the infrastructure implications are.
- Patterns that depict how PLEs may mediate in common use situations, including how resources may be used.
- Services that PLEs may use.
- Specific software that may contribute to PLE functionality.

It is anticipated that this work will add to the richness of PLE descriptions.

## 5. Exemplars

Three PLE systems are described here, together with their more obvious positioning on several of the above dimensions. Of the exemplars, the only system that has been used by end users is Colloquia. The others are still, to different degrees, under development.

It should be noted that the systems that are described are only a selection of PLEs under development. Interested readers might want to examine the output from the 2005 JISC-CETIS Conference's PLE theme [9], [10], [11].

### 5.1. Colloquia

Colloquia [3] uses peer-to-peer communication mediated by an e-mail server, and provides support for a conversational and activity based model of learning.

Colloquia maintains information about people, resources, and tasks. Teachers set up activities and sub-activities at different levels of granularity and allocate people, resources and tasks to those activities. There is a distributed locus of control in that learners who are assigned to activities may create sub-activities. Communication between users happens in the context of different activities. There are special conversation types for different patterns of interaction between learners and teachers to aid setting tasks and assignments, for submission of material, and to convey assessment results. Personalisation is only possible in a limited sense in that teachers and learners may add resources for an activity or sub-activity.

As might be expected for a system developed in the late 90s Colloquia is neither pluggable nor functionally extensible, and offers neither package nor application compatibility. Colloquia could potentially be used across institutions, although probably with a centralised e-mail server.

## 5.2. The Manchester PLE

The Manchester Framework [6] was constructed as a spin-off PLE development from the Bodington VLE [12]. This initial starting point was developed and extended by a team at the University of Manchester. The Framework consists of a servlet container (Tomcat), underpinned by a virtual file store (VFS) that provides servlet and JSP authors with a variety of primitive operations that support the implementation of e-learning systems. The VFS includes an XML database, eXist, which is intended to be used as an experimental replacement for conventional RDBMSs that are generally used in VLE implementation. This reflects a move away from the difficulties posed by relational database table modification during functional system extension. The Framework may be instantiated as either a PLE or a VLE. Multiple PLEs may be served by one or more VLE servers, potentially in different institutions. While a user is online the VLE is expected to be the system of choice, and while s/he is offline the PLE is the only system that s/he can use. The common VLE and PLE framework allows application compatibility.

Other characteristics are that the system is as yet just a framework, it has not been populated with applications delivering a particular pedagogic approach. It is considered that the framework is pedagogically neutral. Collaboration will need to be implemented via the VLEs or other servers running

collaboration applications. Finally, more work remains to be done, notably finishing the implementation of VPTP, and providing servlet and JSP based applications. VPTP [13] is an HTTP-based protocol suitable for the implementation of PLE-VLE communication, and possibly, for use in the implementation of a Universe of PLEs (cf. Section 3.1)

## 5.3. PLEX

PLEX [7], the CETIS PLE, exists in two versions based on two different technologies, the Eclipse rich client framework, and the LifeRay Portal. The primary Exist-based version of PLEX is discussed here. This version is highly pluggable via Eclipse's plug-in architecture.

The basic structure of the PLEX has echoes of Colloquia:

- A resource manager currently contains a bookmark editor, with a 'smart group' feature that allows queries. The resource manager also deals with RSS feeds. The resource manager maintains both personal collections and provides different ways of sharing resources.
- A people manager includes notions of friends and colleagues, and remote groups 'owned' by other people. Advantage is taken of 'friends of friends' to find interesting people via one or more hops through other users' friends lists.
- Resources and people can be grouped into activities. Like resources and people, activities are discoverable, and can be imported into a user's PLEX workspace.

PLEX has recently been extended [14] to allow users to create personas for different learning topics. The user may construct an opportunity tree for each persona, representing potential activities that the user may undertake. Starting to undertake an opportunity transforms that opportunity into an activity.

PLEX is still under construction, and could move in different directions in the PLE space according to ongoing development.

## 6. Conclusions

A space of PLEs has been outlined and three exemplars have been partially positioned in this space. The multiple dimensionality of the space indicates the large size and diversity of the current PLE space.

PLEs are destined to become important components of the e-learning domain. As the field

matures and as the term Personal Learning Environment is generalised or specialised changes to the characteristics of the PLE space will almost certainly be inevitable.

The author would be pleased to enter into correspondence about the contents of this paper and about changes that occur in the field over time.

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