

Inverting the Student - Institution Relationship: the Role of Personal Learning Environments

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Abstract

Technology has so far been used by educational organisations to replicate existing practices, and has done little to help learners make sense of their total learning experiences, lifelong and lifewide. This is no longer acceptable in a fast changing global context. Personal Learning Environments are systems that are extra-institutional, and operating within a service based technical environment, can help learners integrate their learning activities and experiences. This paper elaborates the definition and function of PLEs, and provides some early examples, along with recommendations for actions by educational institutions.

Introduction

In this paper it is argued that Personal Learning Environments (PLE) are a necessary intervention to allow the education system to support the needs of modern learners. In order to do so it first elaborates what it is that is being intervened in, and states with some precision the nature of the mechanisms that are set in motion through the introduction of the PLE. Unlike other institutional learning systems (for example, the Virtual Learning Environment or Learning Management System) the PLE, whilst it may meet an institutional need, is not bounded by the institution: it is fundamentally extra-institutional. The PLE situates itself around the 'learner' and its emphasis is on the learner acting as the coordinator of their own technology for both interaction with institutional systems, and other systems which relate to the learner's life. The efficacy of the PLE rests on it being an 'effective systemic intervention' rather than an architected whole-system solution. It is in the characterisation of the PLE as intervention in a system which already exists that has necessitated a radical approach in characterising its operation: the challenge is to describe that 'existing system' in a consistent way, and to situate the PLE intervention within it. It is for this reason that we have sought a cybernetic representation of social ontology.

Using technology to manage complexity

The formal education system has an enormously complex task to perform; to provide appropriate learning opportunities for a hugely varied population, varied by age, aptitude, interest and capability – and to respond to this challenge through a system comprising a range of institutions (schools, colleges, universities, certification authorities etc.), balancing the interests of different political, commercial and social stakeholders. One could argue that given the complexity of the challenge, the system that has evolved over the years functions remarkably well, and has adapted to the changing needs of modern society extremely well. However, current demands on the education system are greater than ever before, and pressures to provide learning opportunities for a knowledge based society are increasingly insistent.

The education system and its institutions have evolved a range of mechanisms for managing the complexity of the challenge it faces. Ashby (1956) proposed the Law of Requisite Variety, which applied here suggests that the variety of the

learning population needs to be soaked up by the variety of response that the education system makes. Traditionally the education system has managed this problem in a supply-led way. Knowledge is divided into subjects, subjects into curricula, curricula into courses that can be delivered in some logical sequence based on levels of difficulty; and these are distributed across schools, colleges and so on. The variety of the learning population is itself reduced by categorisation – by age, aptitude or interest, using various assessment mechanisms. These approaches to managing variety lend themselves well to a campus-based model of education, where subject-based departments use timetables to structure access to learning for specific cohorts of students, and use assessment methodologies to manage progression.

From an organisational point of view, this approach to variety management has worked and continues to work very well, to the point where it seems inevitable. However, it faces some serious challenges. Globalisation and modern communications have created a world where knowledge is growing and changing rapidly, where businesses are having to work hard to adapt to increasingly competitive circumstances and are demanding an adaptable and flexible workforce, which in turn requires people to become lifelong learners to develop and maintain high level skills and knowledge. The traditional model of education is struggling to cope with the demands of widening participation in higher education, resulting in a plethora of initiatives to adapt what universities do, how they do it and how it is funded. For example, in recent years the UK has introduced student fees, new work-based foundation degrees, a new 14-19 diploma, and the initiatives continue apace.

New internet technologies have also been seen as potentially playing a key role in helping education to cope with the challenges of adaptation, and in over the last decade many institutions have installed VLEs. These have typically allowed learners to access learning materials, engage in group discussions and take quizzes, and played a major role in getting teaching staff to engage with technology. However, their promise has not been fully realised. In the main VLEs have been used to supplement existing courses, and most institutions continue to deliver predominantly timetabled face to face teaching. Despite huge investment in learning materials and related technologies there is little content sharing, and few courses provide all their material online. New pedagogic opportunities offered by learning technologies are not seeing widespread exploitation, broadly speaking, teaching continues pretty much as before. The classroom has simply been partially put online, and the potential for creating a more flexible, customisable and personal educational experience has not come about.

The challenge of a changing technological landscape

Many reasons have been given for the slow rate of adoption of learning technologies by educational institutions. One argument that has been made is that learners' ability to use technology has been too limited. Everyone knows how to attend a class, but using a VLE requires technical ability, the argument goes – students need training and support to develop these technical skills, and we should be careful not to create technical barriers to learning. Although there is some truth in this, the case has been overstated, and is certainly far less of an issue as the population becomes increasingly technologically sophisticated. Ten years ago, universities provided access to technologies that did not have widespread availability domestically – broadband internet access and sophisticated software systems and tools (including learning technologies). This is no longer the situation. The majority of the population have home broadband access to the internet, and with the growth of social software and so-called Web 2.0 technologies, are engaging in increasingly sophisticated technological

activities – blogs, wikis, photo and video sharing, discussion groups, instant messaging, shopping – the list grows. They also use an increasing range of personal digital technical systems – MP3 and video players, smart phones, DVD recorders, video cameras, set-top boxes and so on. Technologies available in the home are often richer than those in widespread use in educational institutions, to the extent that education is in danger of becoming a technological ghetto.

How should education respond to this? Should we develop e-learning systems that provide a richer experience than that already on the social web? Should we continue to develop learning materials that can only be accessed from within a VLE? Or should we seek to exploit the technologies that learners already have access to, ensuring that anything we develop can interoperate seamlessly with these technologies? What would this mean for institutional technology management?

A cybernetic model of the student-institution relationship

Before these questions can be properly addressed, it is necessary to elaborate further the mechanisms of engagement between learners and institutions. Beer's Viable System Model (Beer 1979, 1982, 1985) provides a useful set of distinctions for modelling this.

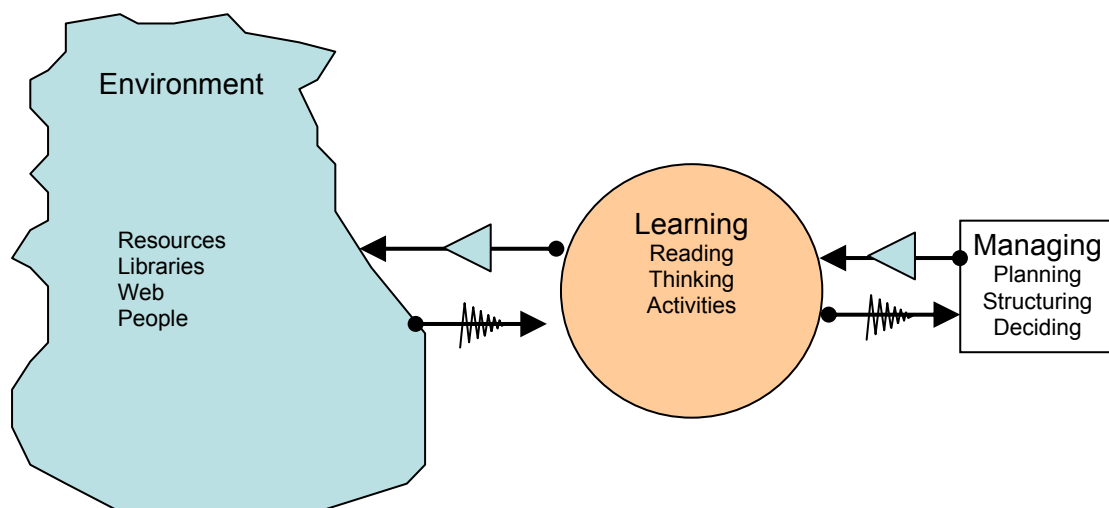


Figure 1: A student on a course

Figure 1 proposes that there are three significant systems that can be identified in a student participating in a single course: managing their learning, learning activities, and the context or environment in which these take place. Learners need to plan and structure how they use time and resources (e.g. using diaries and folders); they need to actually do the learning (read, listen, do experiments, discuss, reflect, write etc.); and this happens in a context which includes learners and other people, resources (in libraries or the web), other facilities and technologies. Inevitably the environment is much more complex than the student is capable of engaging with, and so instruments are needed to help to make the environment tractable. Similarly, the resources student have for managing their learning are necessarily coarser than their learning needs, and again, there is a need for constraining options without too much damage to learning opportunities.

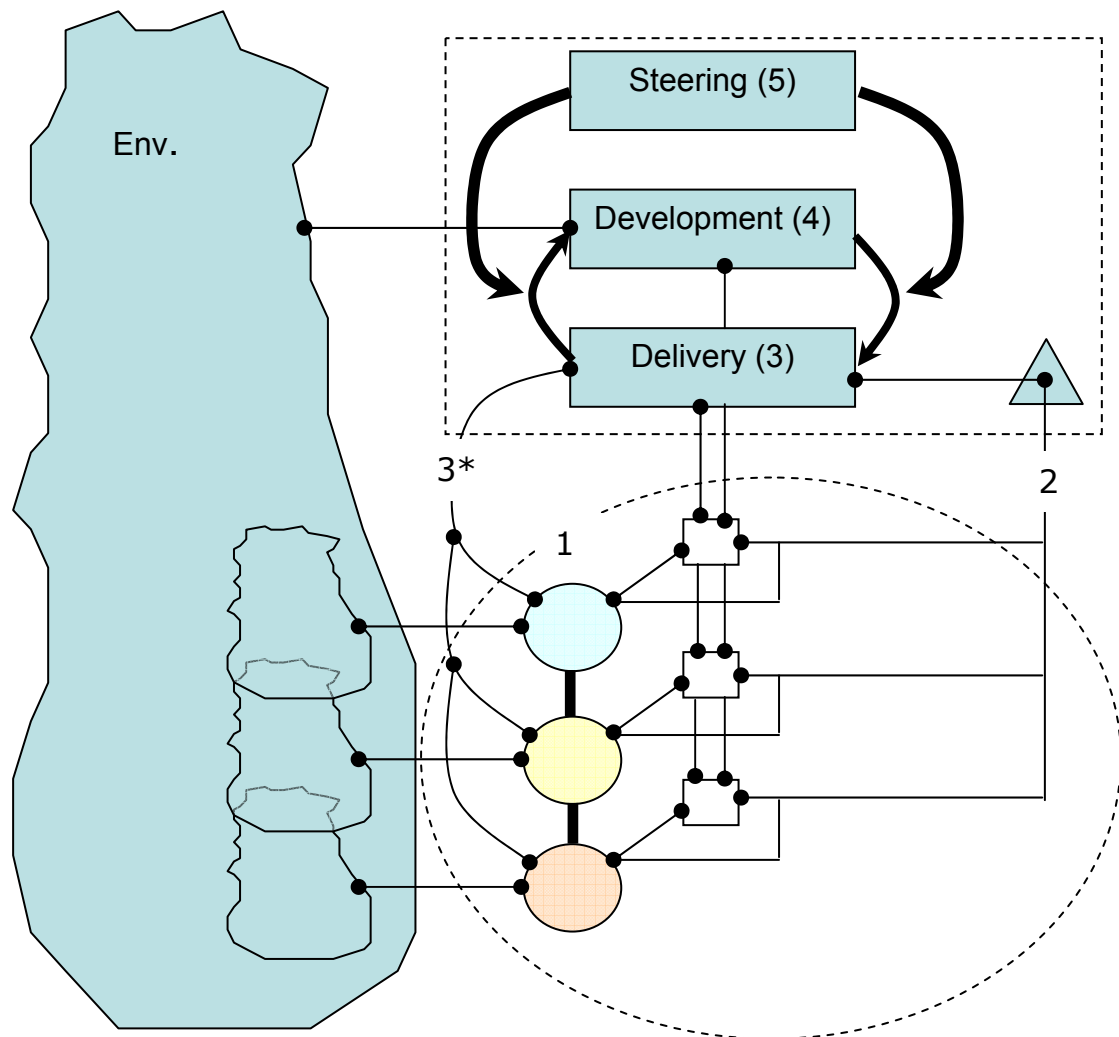


Figure 2: Course management

Figure 2 models course management. Three students are represented, all managing their own learning, engaging in learning and interacting with their environments (which may or may not be the same). On a typical course, a teacher would have the responsibility to manage a group of learners, and how they do so would depend on a range of factors – the size of the group, the length and frequency of lectures, resources available and so on. The diagram identifies a number of systems and channels, as follows:

System 1 comprises the learners. They operate as a group, and if the opportunities exist, can enrich each others' learning through self-identified and organised activities

System 2 is concerned with coordinating the learning of the group with the aim to achieve harmony in the group, ensuring each learner gets what they need. This is where pedagogic design is typically applied.

System 3 is concerned with formal aspects of course management – rules of engagement, learning contracts, resource management, assessment.

System 3* provided the monitoring function – providing a system health check. Are the students learning? Are any of them struggling? Formative assessment plays a role here, as do tutoring and mentoring.

System 4 provides the mechanisms for adaptation. How can the teacher improve what they are doing? What is there in their environment that can help (materials, pedagogies, technologies)?

System 5 is concerned with overall steering of the course, and especially in regulating the balance between course delivery and adaptation. Too much adaptation leads to confusion; too little results in stagnation.

This is a grossly oversimplified representation of the application of the Viable System Model (VSM), which provides a framework for the deep analysis of organisational structures and processes. Here it is presented to illuminate the tasks that are faced by a teacher in managing the delivery of a course, and to make a number of useful distinctions. It has been used by the author previously to provide an analytic framework for the pedagogic evaluation of VLEs (Britain and Liber 2004). VLEs can be examined to see if and how they facilitate the requirements of each subsystem.

What tools are provided to help the cohort self-organise?
Do they permit a range of pedagogies? Which?
How are the rules of engagement made evident or negotiated?
Can the teacher easily monitor learning progress meaningfully?
Can a course be adapted while it is running?
What tools are there for a teacher to provide overall management for the course?

The Viable System Model is a recursive model. It can be applied at higher and lower levels of the organisation to provide diagnostic and design insights, and could be used to illuminate how departments manage courses, how institutions manage departments, and how the state manages its institutions. It has been used to model public and private organisations and nation states (e.g. Espejo and Harnden 1989).

Personal Learning Tools for lifelong and lifewide learning

In the case of education, using the VSM at the next level down – the level of the student and below – provides the insight that courses actually are comprised of student fragments, not whole students. Students typically are involved in other courses (at the same or other institutions), may be engaged in informal learning, and might have jobs where they are taking training courses. Very little support has been provided by institutions to help individuals to make sense of all the learning they have made and are making, beyond ensuring that formal progression requirements are met. VLEs provide no tools to help students to bring together and coordinate their learning experiences – the people they learn with, the resources they use, the tools they use and the things they do. The VLE only provides management tools for teachers. In an extreme case this may result in a single learner having to use WebCT for one course, LAMS for another, while at the same time using something like the social site www.43things.com to engage in some informal learning. They would end up with several email and discussion forum accounts, and have messages located in several places. In a situation where one could only access technology at an educational institution this might have made sense, but not in the modern world. It is necessary for institutions to start providing technical systems that provide information and activities that can be displayed and stored on learners' preferred technical systems (and devices). These are all components of their Personal Learning Environment.

The VSM can be used to suggest the functionality of PLEs.

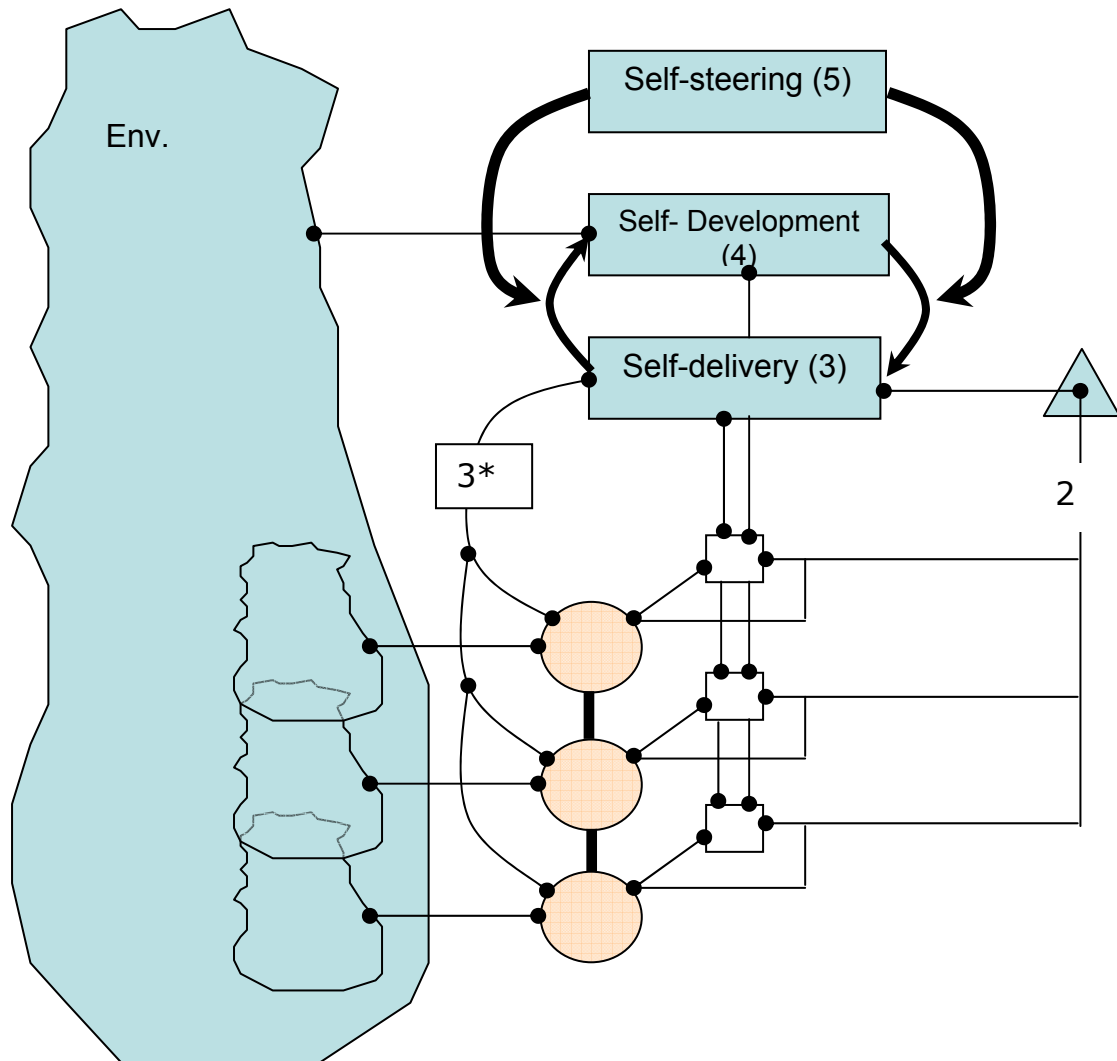


Figure 3: Integrating the Learner

In Figure 3, instead of thinking of multiple learners, the components become the fragments of an individual learner. The tools that are suggested by the model that a PLE needs to incorporate are as follows:

System 1: sense making tools to help a learner synergise the different learning activities they are engaged in (where relevant)

System 2: Coordinating their learning: time management, scheduling, resource management, communication with peers, etc.

System 3: Helping to manage their commitments to different activities

System 3*: Self evaluation, reflection

System 4: Identifying and finding new learning opportunities. Personal development planning.

System 5: Managing and developing your identity – who do I want to be and which new opportunities will help me become that?

PLEs need to allow learners to engage in all their learning activities, formal and informal, and integrate their learning, lifelong and lifewide. The VSM identifies the range of self-organisational tools PLEs need to incorporate; to get greater precision in what these might be, it is necessary to examine existing tools and underlying patterns of software use.

PLE functionality: a pattern-based approach

In 2006 a research project to define Personal Learning Environments and to develop a reference model for future implementations was funded by the UK Universities Joint Information Systems Committee (JISC), to be undertaken by the author's own Centre for Education Technology and Interoperability Standards (CETIS). The project's main report is available online (Johnson et al, 2005). A key approach to identifying PLE functionality was to identify a set of software usage patterns following Alexander's (ref) approach to architectural design. The project identified a network of 77 patterns relating to current user behaviour, and through the identification of common services behind these patterns, specified the necessary service layer of the PLE sufficient to satisfy all identified patterns. These patterns and services are described in detail in the report, along with the service bindings (where they exist) that are associated with them. The patterns were categorized as follows:

Context Patterns

Context involves the general setting-up (and destruction) of relationships – either between a tutor and a student, or a student and other students in a learning relationship. This may take the form of technologies to establish online presence, for example.

Conversation Patterns

Mechanisms for maintaining conversations in learning, including support for moderation and collaboration.

Network Patterns

A network pattern involves the mechanics of communication between an end-user tool and a service. Included within this category of activities are the general manifestations of uploading and downloading of data, conduit and feed services. A number of emerging protocols (like ATOM) address this issue

Resource Patterns

Resource patterns concern the actual content of the data that is transferred, its categorisation into particular forms, and the services which relate to its acquisition, like search. In this area are found concepts like 'smart folders' which can be programmed by users to display content dependent on search criteria.

Social Patterns

These patterns relate to the management of personal profiles together with the management of other social contacts and contexts.

Team Patterns

A distinction was made between the management of individuals (in the above category) and the management of groups which may be formed from the

sharing of practices. Here services allow for (for example) invitation to groups, and distributed communication.

Temporal Patterns

This group of patterns relate to the management of personal time through calendaring services, alarms, etc.

Workflow Patterns

The organisation of the sequenced activities, which may include technologies to support the management of commitments made by both student and teacher (e.g. conversation for action), but which may also include specialised pedagogical sequences as we might find expressed in a Learning Design.

In order to meet the requirement of the above patterns, the Personal Learning Environment needs to provide the essence of functionality provided by the patterns. To ensure the consistency of approach to the understanding of current user practice, the patterns identified must be satisfied through the intervention of the Personal Learning Environment. However, the patterns observed reflected the usage of particular tools. The Personal Learning Environment, however, will afford the functionality of these tools through the provision of services. It is therefore necessary to identify the services which pertain to the tools that underlie the patterns and to deploy these within the context of the Personal Learning Environment.

As a result of analysis of services provided by tools, 8 key services were identified which embody the behaviour of the tools studied. They are:

Activity Management

Activity management provides coordination between disparate resources and people and relating these resources and people to particular learning activities and events.

Workflow

Learning activities and events are coordinated by a workflow service through which the sequencing of events is coordinated. Through the workflow services commitments can be established, monitored and maintained in a similar way as is currently afforded by the VLE.

Syndication and Posting

The primary mechanism of learning content delivery is through syndication and posting services. It is through these services that content may be accessed directly (through the subscription to feeds, etc), or indirectly (through the interaction with Activity Management and Workflow services in the course of a learning engagement). Syndication and Posting services play an important role both in publishing (i.e. to wikis, blogs, etc) and in resource management.

Group

Group services afford the management of people and social networks. This functionality plays a central role in the coordination of learning activities, the sharing of resources, collaborative working, etc.

Rating and Annotation

Rating, annotation and recommendation services perform a central role within the Resource Management patterns. All of these services can feed

back into the mechanism to manage resources and feed them to other participants.

Presence

Services relating to presence are contained in a Communications Tool Provider which also provides facilities for chat. Through these services, the patterns relating to the use of Instant Messaging services may be satisfied.

Personal Profile Service

The PLE facilitates working across the boundaries of conventional communities of practice. With each of the different communities a learner engages with, the learner will present themselves in a different way. It is through the action of the profile broker that different personas may be managed, and the cross-community relationships of those profiles may be established. In a sense, the action of this body of services may be likened to the current activity of using two VLE systems in different institutions.

Exploration and Trails

The exploration and trails service fulfils the patterns relating to opportunity exploration. Within these patterns the activity currently associated with search engines, and general browsing for information are subsumed into a body of services which integrate with social services, profiling, rating and annotation, etc.

To summarise, a PLE needs to support the patterns groups identified earlier. This can be realised through a service based framework, which incorporates the services above. The PLE could itself be a simple desktop or web-based tool which can be interfaced to the services in a hopefully simple way, at least from the learner's perspective.

Examples of PLEs

To demonstrate the concept of a desktop-based PLE client, the project developed a prototype system named PLEX. This simple tool provided for the management of people, learning resources, and learning activities. These different categorisations of activity are represented PLEX as three "perspectives": Resources, People, and Activities.

Resources

Learners can organise resources flexibly including facilities for sorting and filtering. Bookmarks can be shared with others in a flexible fashion using existing shared bookmarking services (del.icio.us and simpy) and also weblog services using Atom (e.g. Blogger, LiveJournal).

An import capability and also a default set of feeds were also implemented.

People

The People aspect of the prototype deals with the management of groups of contacts but also the discovery of people using the Friend of a Friend (FOAF) protocol. An import feature enables the user to discover friends-of-friends to expand their social network.

As well as organising people into groups defined by the user (for example, as "friends" or "family"), a feed was implemented for obtaining groups of people that used the IMS Enterprise Web Services specification, which is

concerned with the supply of student information to e-learning applications.

Activities

The Activities aspect builds upon the management of resources and activities, containing people resources and sub-activities. Activities can be subscribed to and refreshed using a context feed from a notional Activity Management Service, and published using a context conduit.

As there are currently no good candidate implementations for an Activity Management Service feeds and conduits were implemented using RDF, based on the FOAF and Dublin Core vocabularies, as described in Wilson (2005).

Patterns were identified for implementing workflows; however, there was insufficient time in the prototype development to properly investigate and implement this aspect of activities.

PLEX provided a reference implementation of a PLE with pointers to how all the patterns might be implemented. However it is important to stress that it is not envisaged that all PLEs will necessarily have identical functionality, rather significant overlap. There are several other candidates in the PLE space, that bring together many of the patterns described. The most notable system under development is the European Sixth Framework Programme Integrated Project "Ten Competence"¹, led by the Open University Netherlands. Addressing the challenges of lifelong competence development in emerging areas of competence need, and as part of the creation of a larger infrastructure, the project is developing the Personal Competence Client, containing many of the features of PLEX but designed for use in real learning situations.

Other widely available systems that implement significant elements of PLE functionality worth looking at are listed below, but these are only a sample:

Pageflakes: <http://www.pageflakes.com>

Netvibes: <http://www.netvibes.com>

Google IG: <http://www.google.com/ig>

Yahoo 360: <http://360.yahoo.com>

All of these allow users to combine resource, organisational and communication tools to manage disparate materials and activities. With appropriate further development, they could as easily be used to interface to educational systems provided by universities.

Implications for Educational Institutions

Education providers need to recognise that learners have access to powerful and enabling technologies, and to find ways in which they can exploit them. They should stop providing facilities the learners already have (e.g. email) and instead focus on making sure that their systems and resources add value to the learning experience. They should make sure that any learning resources can be accessed and viewed on all devices, and not locked into VLEs. They should let learners use whatever communications tools they wish, but facilitate interoperability where necessary. Importantly, they should provide those tools that are not available more widely – specialist tools for specific academic subjects, pedagogic workflow

¹ <http://www.tencompetence.org>

services and so on, depending on the institution. These should be available as services, with open interfaces to allow PLEs to interact with them.

The transition to this model will take time, effort and imagination. Initiatives like the e-Framework consortium², developing a service oriented framework for institutional technology and the Ten Competence Project are examples of progress in this direction.

Conclusions

This paper describes how educational organisations have used various technologies to manage the enormous variety of the learning population, and suggests that traditional campus-based and face to face approaches are inadequate to meet the challenges of modern societies in a global context. The requirements to provide for lifelong learning and wide access to higher education threaten to overwhelm the education system. However, the very technologies that have contributed to the problem by creating an ever changing environment can be recruited to help with tackling the problem. Instead of developing technical systems that replicate existing procedures, which it is argued that VLEs do, educational organisations need to recognise that many learners now have access to and use sophisticated tools and technologies, and adapt their own systems to interoperate with these.

Applying the VSM, the key problem of the fragmented learner was identified, and that current technologies do not help resolve this issue. Personal Learning Environments promise to give control to the learner over their learning and helping them make sense of their learning journeys. PLEs are thus proposed as a key concept for future educational technology, and this paper has elaborated the definition and scope of this concept, by defining a range of patterns and services that help in specifying systems. Several examples of proto-PLEs were given, ending with some proposals for how institutions need to change their technical systems in order to exploit the benefits these new technologies may bring.

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² <http://www.e-framework.org>

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