Towards a reference model for the personal learning environment

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The concept of 'Personal Learning Environment' (PLE) is fast emerging as a significant branch of learning technology. This paper describes the approach to this topic adopted by the Centre for Educational Technology and Interoperability Standards (CETIS) PLE project in the definition of a PLE Reference Model and in building a PLE prototype. In a domain that is typified by emerging technology, discursive differences and a lack of common terms of reference, we explain our approach in identifying three perspectives on the PLE for analysis: themes, patterns and categories. These three strands are viewed as different 'strata' to approach the topic, the interplay between which has led to a perspective on the PLE which has combined an analysis of current PLE-focused discourse (themes), an examination of current practice (patterns) and an attempt to define phenomenological categories of the 'PLE experience' from the philosophy of technology and cybernetics. We introduce our model as the focal point for these different investigations and discuss how the model can help in the effort to coordinate technological and discursive developments that will ensue in this area. We argue that the approach adopted in defining the model has allowed us to produce an effective tool for coordination of discourse and technological design, and that the identification of categories has contributed a powerful element to our analysis – one which may have application in other areas of e-learning.

Keywords: personal learning environment, service oriented architecture, reference model

Introduction

The concept of 'Personal Learning Environment' (PLE) lies behind some important recent technological developments in e-learning. There are currently a number of e-learning software projects with a claim to being PLEs, whilst at the same time there is a diversity of interpretations of what a PLE might look like and do. This too is reflected in the discourse, which by its emergent nature is largely being conducted through blogs. Attwell, for example, sees the PLE as having a significant effect in empowering users of informal learning resources, away from institutions (Attwell, 2006). Alternatively, it can be seen as a way of managing personal goals in the context of personal development planning (Heibert, 2006). In addition to this, the PLE has its detractors, amongst whom Blackall argues that a desktop operating system will suffice for most of the needs of learners, and that specialist tools (be they VLE, PLE, or what) are not required (Blackall, 2005).

Such disagreements and divergences are symptomatic of a lack of clarity in the terms of reference of the PLE, and it is to this lack that the CETIS project has addressed itself. This is seen as an important goal, for despite the differences of opinion, it is clear that significant technological change in the form of 'Web2.0' (O'Reilly, 2005) technologies and service oriented architecture are contributing to significant changes in user behaviour. Within this changing environment, it is reasonable that emerging learning technologies will have to account for these environmental changes, as will the practices and organisational structures employed by educational institutions. However, without clear terms of reference and a definition of the characteristics of the PLE, a coordinated approach to the planning and design of new learning technology cannot take place.

For such a model to be an effective tool for coordination, however, it should be able both to embrace a range of practice and opinion which is at the very least diverse and sometimes contradictory. It is this contradictoriness that forms the essence of our approach. We start by accepting that there are many possible descriptions of a PLE to be made, and not all of these descriptions are compatible with each other. But a diversity of description doesn't necessarily mean that an effective coordination of learning technology in a transformed environment cannot be achieved. The purpose of the project has therefore been to discover ways of achieving a 'coordination of descriptions' of the PLE, and this we have

approached through a careful analysis of different strata of description. The strata we have chosen are: an analysis of opinion of what the PLE is, and what it means; an analysis of current patterns of behaviour with technology; and a philosophical analysis of learners' relationships with tools for learning, and their situation within the wider educational system.

The strata of the investigation

The levels of description vary in terms of precision and methodological approach. The first level is highly informal where opinions on matters related to technological change and the critique of current technologies are considered. This is in contrast to a rigorous methodical application of Alexander's (1977) 'Pattern Language' technique. Finally, the deepest level considers an in-depth philosophical analysis of the phenomenology of tools and usage and their relation to learning. Bearing in mind this diversity of description, there is a distinction to be made between agreement between the different descriptions and a 'coordination' between them. With regard to this, a 'coordination' we see as a way of guiding technological action (in terms of strategies and plans for adoption, design recommendations, etc). But such a coordinating framework does not preclude the possibility that disagreements over 'what the technology is' may still exist (and given the 'personal' nature of the technology, are highly likely!).

The discursive themes of the PLE

The most diverse stratum of investigation is that of opinion of current developments in technology and critique of existing learning technology. Nevertheless, it is possible to organise this discourse into particular thematic groups. For example, we have identified a group of themes which reflect a dissatisfaction of current Learning Management Systems (LMS) technology – particularly in the light of a reflection in its ability to deliver the aspirations of e-learning. These criticisms reflect:

1 The difficulty of current institution-based LMS systems in catering for the mobile life-long learner.
2 The difficulty of current institution-based LMS systems in allowing for the learner to organise the material that is presented to them. Currently, this organisation of material is controlled by teachers.
3 The inability of current institution-based LMS systems in extending beyond the domain of the course itself, rather than affording the opportunity for the learner to integrate other elements of their lives into their learning.
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5 The barrier that is presented to learners in the requirement to find out 'how to use' a particular LMS (which is more of a problem when a mobile learner has to use two different LMS systems at different institutions).
6 The inability of many institution-based LMS systems in affording the opportunity of greater peer-based pedagogy.

Reactions to such criticisms are widespread and not all of them advocate a PLE (for example, the e-portfolio community would argue that their technology meets some of these issues). For those who suggest a PLE as a response, the central argument is that such criticisms arise from the institutional control of technology, and that if the institution divested technology, and learners themselves took responsibility for coordinating their technology, then these issues could be addressed. Related to this is the view that large-scale centralised provision of technology places a heavy burden of administration on the institution – as issues relating to maintaining up-to-date systems, ensuring security, preventing illegal network practices, etc. all take their toll on institutional resources. In this environment, learners find that their home computers not only out-perform institutional machines, but that the freedom of learners to exploit the latest technologies is restricted within institutions on security grounds. Again, the divestment of technology is presented as a solution.

The creation of a 'pattern language'

The second stratum of investigation is more formal involving the use of Alexander's Pattern Language technique for describing the nature of relationships between different aspects of functionality within the information environment. There has been some work conducted both within e-learning and within

broader systems design which has used Alexander's technique (Goodyear, 2005; Diaz & Fernandez, 2000). Some of this work maintains a somewhat uncritical adoption of Alexander's ideas, which for those more sceptical of his approach (Dovey, 1990), can detract from the obvious practical benefits of creating a pattern language. Our use of Alexander's technique is pragmatic rather than a whole-hearted embrace of its ontological implications. However, the technique allows us to build up a detailed dimensioned picture of functional affordances of existing technologies. The value of such a picture lies in the fact that if PLE technology is to be effective, then the same functional picture must be reproducible from within the new technology.

To create our pattern language we had to examine a range of technological practices relating to the use of current technologies. These technologies range from chat and email to calendaring, blogging and social networking. The patterns we identified through this analysis ranged from identifying 'context' patterns which involved the setting-up of relationships between communicating parties (implicated in the use of online communication tools), to 'temporal patterns' for the coordination of events and 'workflow' and 'activity management' patterns for the monitoring and coordination of learner activity. These two latter patterns we identified with the provision of current LMS technology. Ultimately we ended up with 8 categories of patterns, with 77 patterns overall.

Having identified patterns, our task was to identify the services which were common across patterns. The objective in this was to be able to reproduce patterns through the provision of an environment of services which the PLE could coordinate. Therefore, having identified the services, a reference model could be constructed which described those services necessary to meet the requirements of current technology usage, but which could be accessed and coordinated in a different way (i.e. through a personal learning environment). However, the association of this service-oriented reorganisation of technology with the ideals of the Personal Learning Environment rested at this stage as an assumption, based in some part on the thinking behind other service-oriented developments in e-learning (for example, the UK Joint Information Systems Committee (JISC) e-Framework (Wilson et al., 2004)). For this assumption to be given greater weight, and the PLE presented as a more significant socio-technical development in e-learning, a deeper examination of the PLE was required.

The philosophical perspective

Dovey's criticism of the 'pattern language' method is (amongst other things) that it attempts to give ontological status to the patterns it identifies. This, it is argued, is mistaken since the patterns are identified within a particular social context and are therefore partially emergent from the social conditions pertaining at the time they were observed (Dovey, 1990). In our pragmatic adoption of Pattern Language, we accept these limitations and whilst it takes nothing away from our pragmatic use of Pattern Language in establishing a comparative benchmark between existing technologies and PLE technology, it necessarily leaves the question of the fundamental nature of the technology open.

The challenge of a deeper perspective is to grasp emergent social and technical processes in a way which is not dependent on prevailing social and technical conditions. To do this, our approach has been to construct models of the social ontology of education, to consider the relationship between these models and the reality that can be observed, and to consider the modelled impact of the PLE intervention. In this we draw particularly on the precedent of the work of Winograd and Flores (1986), Ihde (1979) and Heidegger (1962; 1978) and on the work on social ontology by Bhaskar (1979).

Key to the philosophical thinking is Heidegger's characterisation of a 'tool' as something which specifically presents a physical instrumental component to the user, as well as being something with which *doing* is achieved. The relationship between the instrumental component and the 'doing' is complex: Idhe points out, for example, the semi-transparent role that the instrument of the dentist's probe plays in the dentist's work of examining teeth, whereby the dentist is sometimes made aware of tool, at other times he may not be, focussing directly on the work done with it. What is key in this characterisation is that the 'instrument' matters in terms of the user experience. It would appear that 'knowing how to use' is a combination of ability with an instrument and knowledge of what to do with it.

From the perspective of service-oriented architecture (SOA), this is important because SOA affords a separation between the 'doing' with a tool and its instrument. A web service, for example, may be

accessed in many different ways. This separability between service and instrument allows for significant reorganisational change. On the one hand, it allows for the reduction of 'redundancy of functionality' typified by monolithic systems (and e-learning systems), whilst on the other it allows for the possibility that users themselves may be able to define their own instrumentation whilst accessing common services, and in so doing the 'barrier' of having to learn new instruments to access different services can be removed. Furthermore, SOA presents the possibility that not only may not only take ownership of instrumentation, but may be able to rationalise their physical instruments so that they can achieve more with a less extensive range of instrumental practices. It is through this deeper understanding of the implications of SOA that the PLE situates its characterisation as a service-oriented development which performs the function of removing barriers from learners engaged in using tools for learning, and at the same time promoting the reduction of functional redundancy within educational institutions – a process which in turn will serve learners better. It is through this latter process that a deep justification for the divestment of technology may be situated.

The reference model

The PLE reference model brings together the three strata which we examined. The separation of service and instrument is the primary architectural feature of the model. The Personal Learning *Environment* comprises an environment of services which are accessed through a Personal Learning Toolkit (PLT). This toolkit is the piece of coordinating software that the user actually sees – indeed, it might be easy to mistakenly think of this as 'the PLE' – but this is to lose sight of the 'environment' of services upon which the toolkit depends. A particular toolkit may be associated with a particular learner (although there is no reason why a learner should not access a variety of toolkits).

The Personal Learning Toolkit requires the learner to acquire a set of dispositions to use it. Having acquired these dispositions, the learner is free to exploit and organise services. The relationship between the PLT and the services it uses represents the network patterns identified through our 'Pattern Language'. These demonstrate that communication not only happens between the PLT and its services, but between coordinating services and other services, and in addition a single PLT may communicate with other coordinating services. By this mechanism, the PLT affords the possibility of peer-based learning and social networking.

Conclusion

In the evaluation process of the model we have established a mapping between the reference model and the emerging list of PLE-related software developments. Moreover, the model has brought clarity to the issue of 'what is a PLE and what is not'. In particular the emphasis on service oriented architecture rules out a number of possibilities (including the current desktop operating system). At the same time, the model, whilst it specifies a particular technological configuration, still allows for a diversity of description: ultimately the question 'what is your PLE?' will evoke a diverse range of answers. This can partly be attributed to the essentially personal nature of the technology, and that the very essence of the PLE is personal ownership, but also it can be attributed to the sheer diversity of different services which may contribute to an individual PLE, and the increasing range of tools for coordinating those services.

The reference model, however, is also a response to a deeper question: that given a domain that is characterised by a multiplicity of different descriptions, is it possible to effect a coordination within that domain, even when the establishment of agreement between different descriptions is difficult to achieve? We believe that the PLE reference model, enshrining insight into the transformational processes underway in educational technology, demonstrates how effective technology provision may be planned for in an environment of diverse practice.

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