E-Learning Flexible Frameworks and Tools: Is it too late ? – the Director's Cut

Derek Morrison, Director, Centre for the Development of New Technologies in Learning, University of Bath

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Keywords

Auricle, monoculture, monolithic architectures, lock-in, portals, open source, components, weblogs, Moodle, services, web services, syndication, RSS.

Abstract

The paper *E-Learning Flexible Frameworks and Tools: Is it too late?* is based on some of the author's contributions to Auricle (www.bath.ac.uk/e-learning/auricle.htm), the publicly accessible weblog of the e-Learning team at the University of Bath. The author considers what is likely to happen when the JISC's vision as promulgated in the various documents and calls supporting both the JISC E-Learning Programme and the JISC Information Environment meets the reality of e-learning infrastructures as already being built at the coalface. The author contends that because key decisions and investments are already being (or have been) made, the widespread adoption by institutions of the current generation of MLE/VLEs is in danger of creating a de facto global e-learning monoculture.

Institutional inertia is now extremely high.

The irony in all of this is that it's only now, after a few years of experience, that we are all in a better position to make informed decisions. Whilst it's gratifying to see the quality of JISC thinking about what's required it will now be very difficult for institutions to reverse earlier decisions. Why? Some institutions have been doing more than gathering experience and have made a full-blown strategic commitment to products which represent only one way of offering e-learning. How many have thought about exit strategies? How many exit strategies will work? How many will now be willing to allow 'different e-learning tools' that don't fit into the licensed, and therefore supported, vendor's product? Is it possible to think beyond the monolithic VLE model? The author will illustrate his presentation with some of the alternatives to the status quo.

The Issue

First, let me declare my current position. I'm very concerned that higher education is, by default, allowing itself to be dominated by a few Managed Learning Environment (MLE) / Virtual Learning Environment (VLE) vendors. As a result, institutions end up locked-in to a particular vendor's range of educational services and pedagogical support structures which only change at a pace consonant with the vendor's roadmap.

The JISC Vision

JISC's initiatives under the E-Learning Programme banner appear to recognize that technology and systems need to be sufficiently flexible in order to support diversity of learning contexts, learning needs, and ways of approaching teaching and learning.

> *Developments in international standards and specifications for learning content offer increasingly powerful ways of describing educational materials. These open standards also allow **different e-learning tools** to be drawn together in **a common environment** (author's emphasis). An invitation to tender for work under a new JISC 'e-learning Frameworks' programme will see the emergence of a technical framework to support the development of flexible learning systems for UK HE and FE.*
>
> Source: JISC Invitation to Tender document for a E-learning Models Desk Study (para 7) in making reference to the sibling JISC programme E-Learning Technical Framework and Tools.
> http://www.jisc.ac.uk/index.cfm?name=funding_elearning_models

> *This strand of the e-Learning Programme aims to produce a technical framework designed to support e-Learning, and in particular to provide a basis for pedagogic diversity.*
>
> Source: JISC E-Learning Technical Framework and Tools

This is all great stuff and when put together with JISC's Information Environment strategy we should, theoretically, end up with a lot of joined up thinking, e.g.

> *... the Information Environment as it is proposed here aims to offer the user a more seamless and less complex journey to relevant information and learning resource.*
>
> *... the view that digital resources are inherently distributed and will never be delivered by a single service provider*
>
> Source: JISC Information Environment Development Strategy 2001-2005
> http://www.jisc.ac.uk/index.cfm?name=strat_ieds0105_draft2

e-Learning as a Focus for Resisting Change?

But wait! What if the message can't get through because it's already too late?

Institutional teaching and learning strategies have been written, MLE/VLE investments have already been made, integration with information and records systems has occurred, contracts have been signed, training programmes are designed, faculty and students have already been 'trained', content is already being 'locked-in', reputations are at stake; and everyone has got used to one system. Institutional inertia is now likely to be extremely high. For example, reflect on the following fairly typical declaration I'm hearing a lot of lately.

> *We've built a good relationship with our vendor over a number of years and don't want to disturb that.*

Even those institutions which haven't yet made a commitment to an enterprise class MLE but have one or more mainstream proprietary VLEs on campus will find reversal challenging enough, but those who have gone down the enterprise VLE route will generally not be in a position to 'draw together different e-learning tools in a common environment'. Why not? Because the common environment will be that of their chosen vendor and the tools will be those provided within that VLE vendor's product.

In the blind rush towards adoption of the current generation of mainstream commercial VLEs there is a very real danger of an e-learning monoculture developing.

Looked at from the perspective of a university or college director of IT services, or even some university/college chief executives, diversity can equal complexity and complexity can equal expense. It must be incredibly tempting, therefore, to commit to a proprietary single off-the-shelf e-learning solution for the whole enterprise. It has been argued elsewhere that virtual universities tend to be (or become?) concrete and not collegiate in orientation (Cornford J, 2000).

> *… the application of the new technologies is generating a myriad of demands for re-institutionalisation of the university as a far more 'corporate', one might even say concrete, kind of organization*
>
> *Source: Cornford J (2000)* ***The Virtual University is (paradoxically) the University Made Concrete,*** *http://virtualsociety.sbs.ox.ac.uk/pick/pick6.htm*

Other problems ensue if such a monoculture does result from the current lack of 'e-diversity'. Most of the mainstream MLEs/VLEs still appear to encourage the uploading of learning material into the product's own digestive system. Of course you can be reassured you can get it out again and import it into another system because it will be 'standards' compliant.

Or can you?

The reality is far from this ideal. I would suggest that what is required are e-learning environments with architectures which don't assume learning material, content, resources, objects (whatever is your preference), and even learning services have, of necessity, to be embedded within a single monolithic system. Learning objects and services could be and some might argue, **should be**, separated from the vehicle(s) which mediate their delivery. In

this alternative view systems would access and manage learning material/resources via a resource/materials/object repository or even be able to manage and provide access to resources distributed over a multiplicity of sources.

New Players, Partnerships and Models

Some vendors have built systems which embrace the separation of content and process from the ground up, e.g. Giunti Interactive Labs', learn eXact system (http://www.learnexact.com/). Meanwhile, VLE vendors like Blackboard and WebCT, who cannot just re-engineer their products or who restrict functionality for different license levels, have opted for a different survival strategy by entering into agreements with existing learning material repositories like Merlot (http://www.merlot.org/), e.g.

> *Under the partnership, unique among course management vendors, WebCT users will be able to perform targeted searches across the 10,000 learning objects indexed on MERLOT to create their customized online courses in a timely manner. They will pinpoint WebCT-ready content produced by faculty, institutions and publishers, including IMS standards-based learning modules, question databases and quizzes. WebCT users will also be able to easily identify training content designed to help faculty more effectively use WebCT e-learning systems.*
>
> *Source: WebCT Press Release (4 Aug 2004)*
> *http://www.webct.com/service/ViewContent?contentID=22334284*

Note that emphasis on "pinpointing WebCT-ready content". Unfortunately for WebCT the 'uniqueness' of the partnership they allude to above was short-lived because Blackboard followed up with its own press release in September which included the following:

> *The first Blackboard Building Block to be released will be a portal module that uses RSS content syndication to aggregate news about and links to the learning resources most recently added to MERLOT. Additionally, a Blackboard Building Block is planned that will enable instructors using the Blackboard Learning System(TM) to search the MERLOT repository directly from the Blackboard interface. From the search results, they can select specific learning resources and embed links to them within their Blackboard course .*
>
> *Source: Blackboard Press Release (1 Sep 2004)*
> *http://www.blackboard.com/about/press/prview.htm?id=608612*

VLE vendors may offer learning object repositories as additional products but only to those customers who have embraced their enterprise class systems, e.g.

> *As part of Release 2.0 of the Blackboard Content System, institutions can now store and describe learning objects in a central open repository. Through the Blackboard Learning Object Catalog, faculty will be able to locate and import high quality education content for use across course sections, departments and even institutions … The Learning Object Catalog is intended to facilitate the sharing of learning resources among members of the Blackboard community, making it a logical tie-in to the MERLOT initiative.*
>
> *Sources: Blackboard Press Releases (17 August 2004) http://investor.blackboard.com/phoenix.zhtml?c=177018&p=irol-newsArticle&ID=604710 and (1 Sep 2004) http://www.blackboard.com/about/press/prview.htm?id=608612*

There are also some signs that the focus is now switching to a more service orientated model with participation from some major league and emergent players in the e-learning world, e.g., Oracle iLearning, Saba, Docent, IBM Lotus Learning Management System (http://www-306.ibm.com/software/swnews/swnews.nsf/n/shoy5hztby?OpenDocument&Site=lotus) with the latter declaring its intention to:

> *… leverage Web services to embed e-learning functionality into business applications …*

Or, to put the above in simpler terms, a service/component model offers the tantalizing possibility of e-learning escaping from the confines of, or dependency upon, any one platform or VLE.

Or does it?

New models for 'lock in'

Whilst some major league vendors may have certainly grasped the concept of service-driven standards-compliant architectures business logic dictates that they will want **their** services delivered via **their** platform. So where then the swift uncoupling and substitution of services? If so, how then does this differ from, say, a Blackboard Building Blocks model?

Let's take one example. There's an interesting learning management system called Isoph Blue (http://www.isoph.com/software.htm) which appears to be an e-learning engine driven by web services, a fact on which the vendor places great emphasizes:

> *The .NET certification lets our clients know that Isoph Blue functionalities can be easily integrated into existing Web sites, intranets, and Web-enabled applications …*

And at least WebJunction one implementation of Isoph Blue's services appears to be very happy:

> *... Web services made it easy for us to use Isoph Blue as a core component of the portal learning center. Isoph Blue provides the functionalities, and we control how they are presented to our users.*
>
> *Source: http://www.charitychannel.com/articles/article_12192.shtml*

So far so good. But dig a little deeper into the Isoph Blue site and we find:

> *Isoph Blue is generally provided on an application service provider (ASP) basis, meaning that hosting, technology management, upgrades, and support are included in the pricing.*

Note how that it's the **package** of services, not individual services which are being marketed.

The above examples illustrate that ever more sophisticated techniques are having to be employed by vendors to 'lock' consumers to their product range. From the consumer perspective it's important that we don't confuse vendors apparent embrace of specifications, standards, repositories and services as ultimately freeing the consumer from 'lock in'. Unless we are alert and responsive it will merely change the nature of that 'lock-in'.

In the above narrative I'm aware that, in attempting to emphasize how embracing standards and services does not necessarily result in consumer freedom, I've made some conceptual leaps particularly in regard to learning systems based on the concept of services. In order to explain this I need to expand the argument a little to consider alternatives to what's currently being consumed by institutions and, ultimately, students.

Components, Coupling and Services

Instead of forcing users down one MLE/VLE road it would better, surely, for vendors (old and new) to offer discrete high quality/robust interoperable components and services which can be unified via loose coupling to a portal (not necessarily the vendor's portal) or used directly from the user's desktop. In turn such components/services should support a distributed learning object/resources model which can access a variety of repositories/sources. Some vested interests might see this as a business nightmare; others may see a business opportunity.

And what do we mean by reusable components, loose coupling and services?

First, loose coupling. Let's consider the following picture:

Source: http://dewi.ca/trains/daze/couple2.html

We usually have a high degree of faith that the rolling stock that makes up a train stays connected to each other, that all the messages from the driver, e.g. 'apply the brakes', are communicated to the different carriages making up the train, and so the train get us where we want to go. Nevertheless, it's the job of only few minutes for the connections to be broken apart, a carriage taken away and, if necessary, be replaced by another. Using a similar loose coupling model, with a little knowledge and skill, we can remove/replace a computer's processor, memory, graphics card, or hard disk. And so to loose coupling as applied to learning systems:

> *Loosely coupled services, even if they use incompatible system technologies, can be joined together on demand to create composite services, or disassembled just as easily into their functional components. Participants must establish a shared semantic framework to ensure messages retain a consistent meaning across participating services.*
>
> *http://looselycoupled.com/glossary/loose%20coupling*

> *... an approach to designing interfaces across modules to reduce the interdependencies across modules or components – in particular, reducing the risk that changes within one module will create unanticipated changes within other modules. This approach specifically seeks to increase flexibility in adding modules, replacing modules and changing operations within individual modules.*
>
> *http://www.johnhagel.com/blog20021009.html*

With regard to Web Services, Eric Benson offers us this down to earth operational definition:

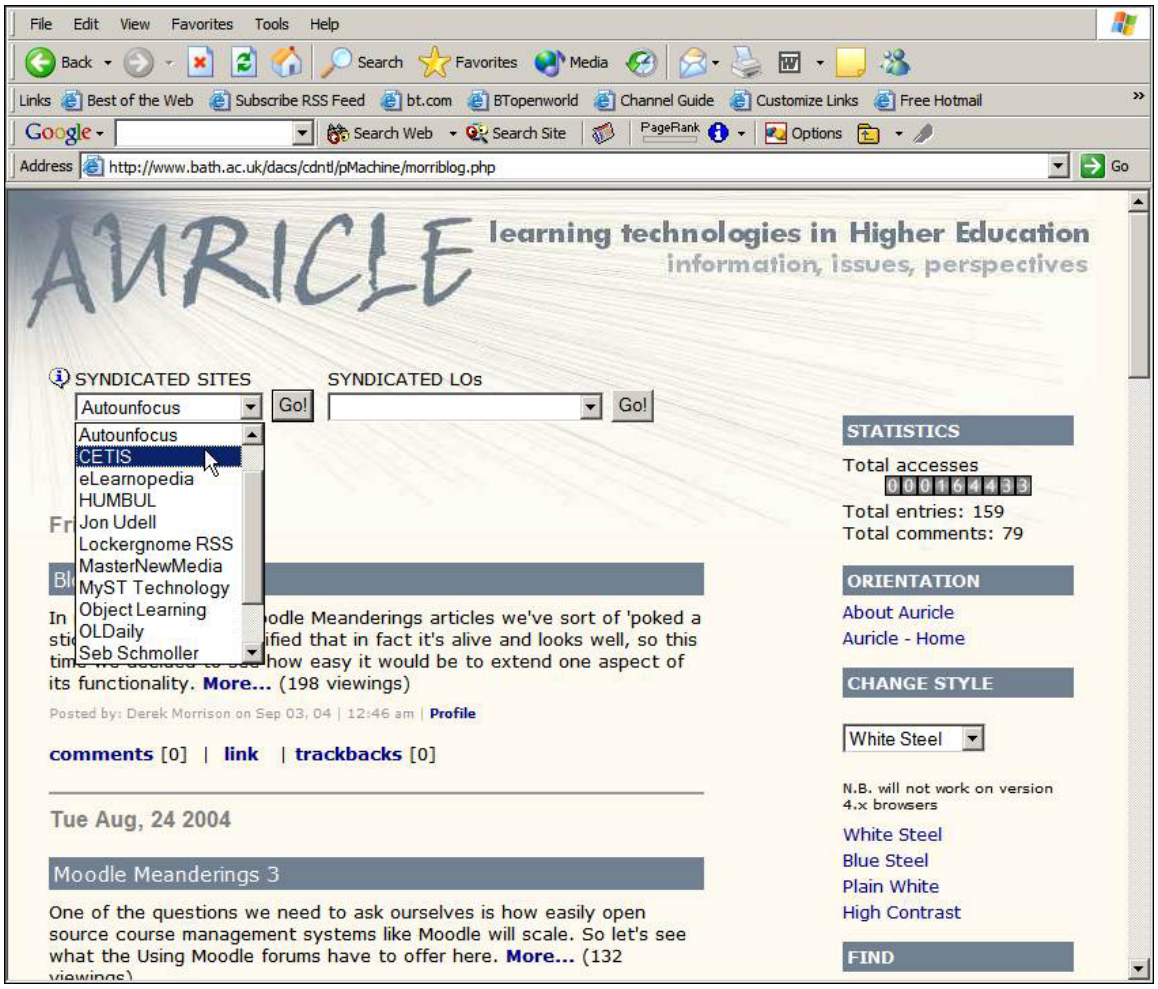
> *A web service is basically a system that lets websites talk to each other, sharing information between each other without the intervention of pesky humans."*
>
> *(Benson E, http://allconsuming.net)*

Or, for those wanting slightly more precision, we have:

> *... a Web service is any piece of software that makes itself available over the Internet and uses a standardized XML messaging system ... XML is used to encode all communications to a Web service. For example, a client invokes a Web service by sending an XML message, then waits for a corresponding XML response. Because all communication is in XML, Web services are not tied to any one operating system or programming language--Java can talk with Perl; Windows applications can talk with Unix applications.*
>
> *http://webservices.xml.com/pub/a/ws/2002/02/12/webservicefaqs.html*

Let's now move from abstract considerations of reusable components, loose-coupling and services and look at some examples.

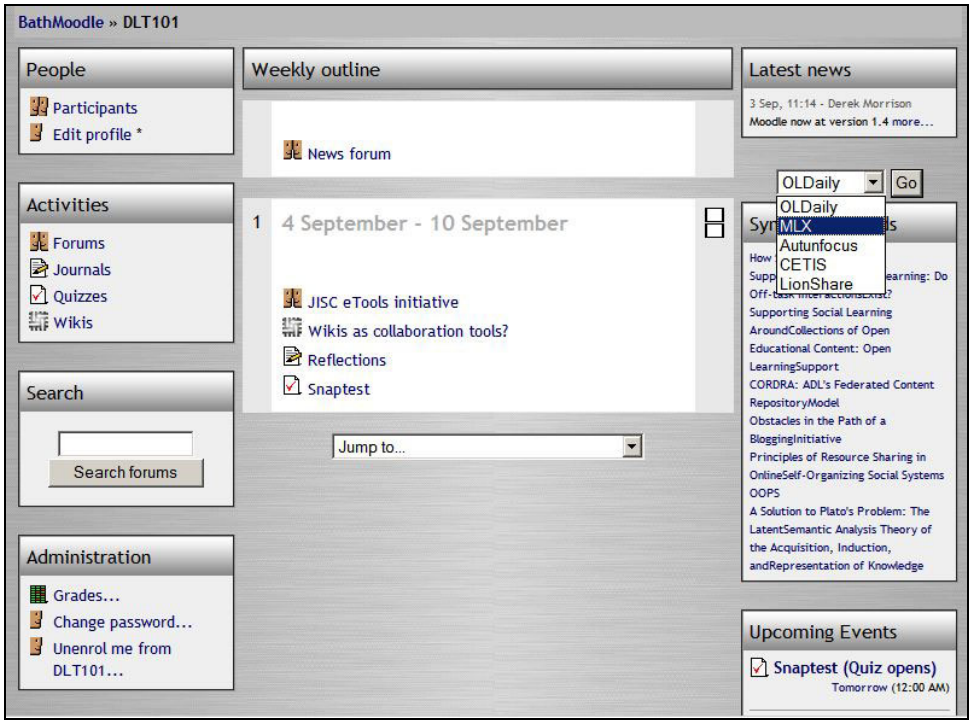
First up will be our very own Syndicated Sites dispenser which started life in Auricle the weblog of the e-learning at Bath team (www.bath.ac.uk/e-learning/auricle.htm) in January 2004 as a mechanism for displaying multiple RSS feeds from designated syndicated sites (see below).



RSS is a relatively simple XML implementation which enables information summaries and links to the originating site to be syndicated to other host sites. Auricle, for instance, as well

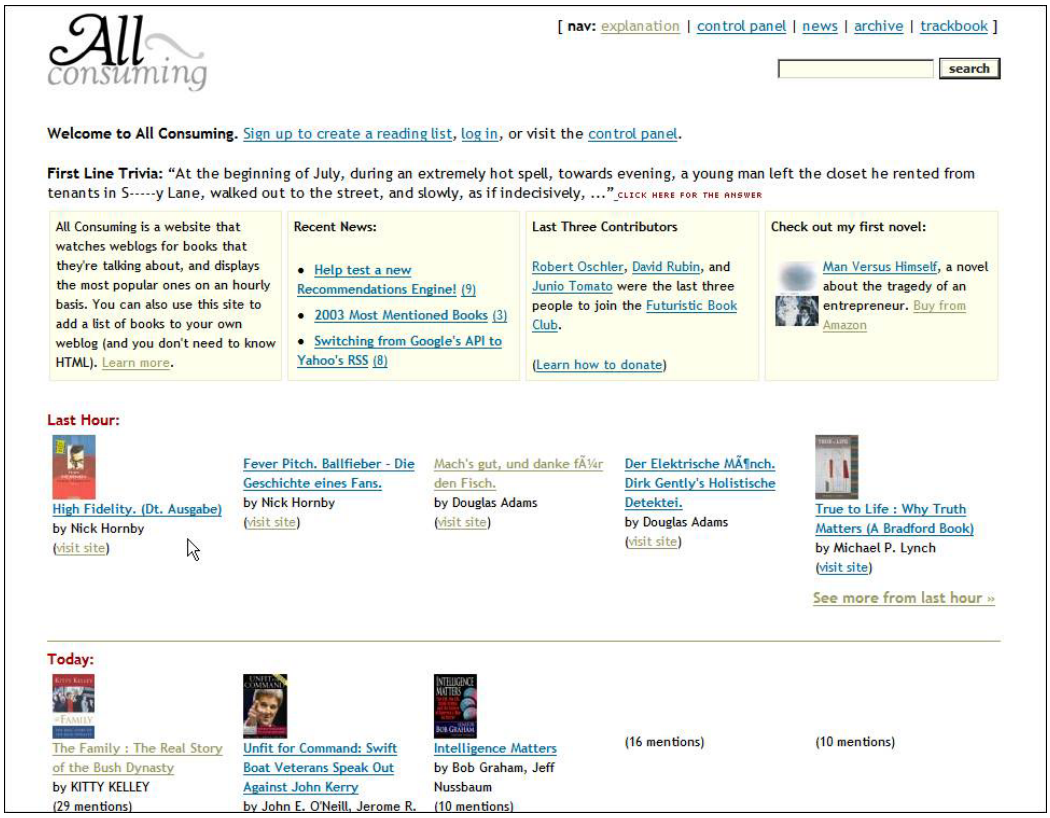
as displaying its own articles, can display articles from any syndicated site (of which there are potentially thousands).

The original Syndicated Sites dispenser whilst continuing to provide sterling service in Auricle informed an enhancement of a 'block' (a loosely coupled functional component) in Moodle (www.moodle.org) the open source learning management system (see below).



The Moodle component is configurable so that each course can have its own set of syndicated resources. Creating such a component extends the basic functionality of Moodle by enabling students to have access to distributed resources in support of learning activities. Similar in concept to Blackboard's Building Blocks, but unlike its proprietary alternative, this modularity is available immediately without any license extensions or expenditure beyond development effort.

On the web services front, a good example of an implementation which 'consumes' the output of a number of services is Erik Benson's All Consuming site (http://allconsuming.net/) which uses web services from Weblogs.com, Amazon.com, Technorati.com, and Alexa.com. All Consuming publishes aggregated information by literally 'consuming' RSS information about books from weblogs supplementing this with information about the book (acquired via Amazon's API). To this mix All Consuming adds news information about each book via the Google API.



Benson's article 'All Consuming Web Services' (Benson E, 2003, http://www.xml.com/pub/a/ws/2003/05/27/allconsuming.html) provides a good overview for those who want more detail of how it was done.

The All Consuming example should encourage us to reflect on the following:

> *Innovation will come from APIs that support 'unintended consequences' "*
>
> *(O'Reilly T 2002 http://www.oreillynet.com/pub/wlg/1707)*

When Amazon, Google et al made their services publicly available via either RSS or an API they had no idea that they would be used to create such a gestalt as All Consuming which adds context, meaning and value beyond what could be provided by any individual service. There is no evidence of such publicly available interfaces from which 'unintended consequences' will become possible forthcoming from the mainstream VLE vendors. For them such access is only granted to trusted 'partners' which is perhaps one reason the proprietary world still needs to realign its development philosophy closer to that of the open source community, i.e aim to make money less from control of the base product set and more towards the added value, support and unique services they can provide.

The Auricle and Moodle Syndicated Sites component processes XML disseminated in one of the several RSS formats of XML. Auricle and Moodle can also produce RSS format XML as well as 'consume' it and so I would argue they meet at least part of the criteria of being a service. However, like mobile phone text-messaging RSS has been somewhat overlooked by some connoisseurs of complexity who believe 'real' services require a deep understanding and

exploitation of WSDL (http://www.w3.org/TR/wsdl), UDDI (http://www.uddi.org/about.html)
WSRP http://www-106.ibm.com/developerworks/webservices/library/ws-wsrp/, SOAP (http://www.w3.org/TR/soap/) et al. Put simply, the barrier to entry to developing services as currently defined appears to be high at the time of writing. Services tend to be coded rather than authored.

But again, along comes someone who provides an elegant, apparently simple and extraordinarily powerful example of how services can work without the technical complexity of WSDL etc. This example can be summarized as "find book in Amazon.com or Amazon.co.uk and see if it's available in the local (or any other) library.

> *Let's say you're on a book-related site (Amazon, BN, isbn.nu, All Consuming, possibly others), and a book's info page is your current page. (Specifically: its URL contains an ISBN. You can click your bookmarklet to check if the book is available in your local library. The bookmarklet will invoke your library's lookup service, feed it the ISBN, and pop up a new window with the result." (Udell J, 2002, http://weblog.infoworld.com/udell/stories/2002/12/11/librarylookup.html)*

Shown below is Jon Udell's example of clicking a browser's bookmarklet link to a user selected library whilst the browser is located on an Amazon book page ...

Source: http://weblog.infoworld.com/udell/gems/ll01.JPG

Which then looks up the book in the designated library.

Source: http://weblog.infoworld.com/udell/gems/ll02.JPG

For an account of the background to the LibraryLookup project and Udell's more flexible approach to service definition then read *The Disruptive Web* (Udell J 2003, http://www.infoworld.com/articles/ap/xml/03/01/06/030106apapps.html).

The development of services (in whatever form they take) has assumed particular importance with the advent of the joint JISC, DEST (Australia), Industry Canada, e-Learning Framework (ELF - http://cetis.ac.uk:8080/frameworks). One of the documents available on the ELF site *An e-Learning Framework; A Summary* (July 2004) contains the following quote:

> *Each service defined by the Framework is envisaged as being provided as a networked service within an organization typically using either Web Services or a REST-style HTTP protocol (http://cetis.ac.uk:8080/frameworks/general/)*
>
> (page 2 paragraph 2)

REST stands for Representational State Transfer and in this protocol calls to functions/methods and any parameters are made using standard HTTP, e.g. http://host/AWebService.php?Function=GetResult&Source=MyFunction.

Amazon.com, amongst others, uses the REST protocol for their web services.

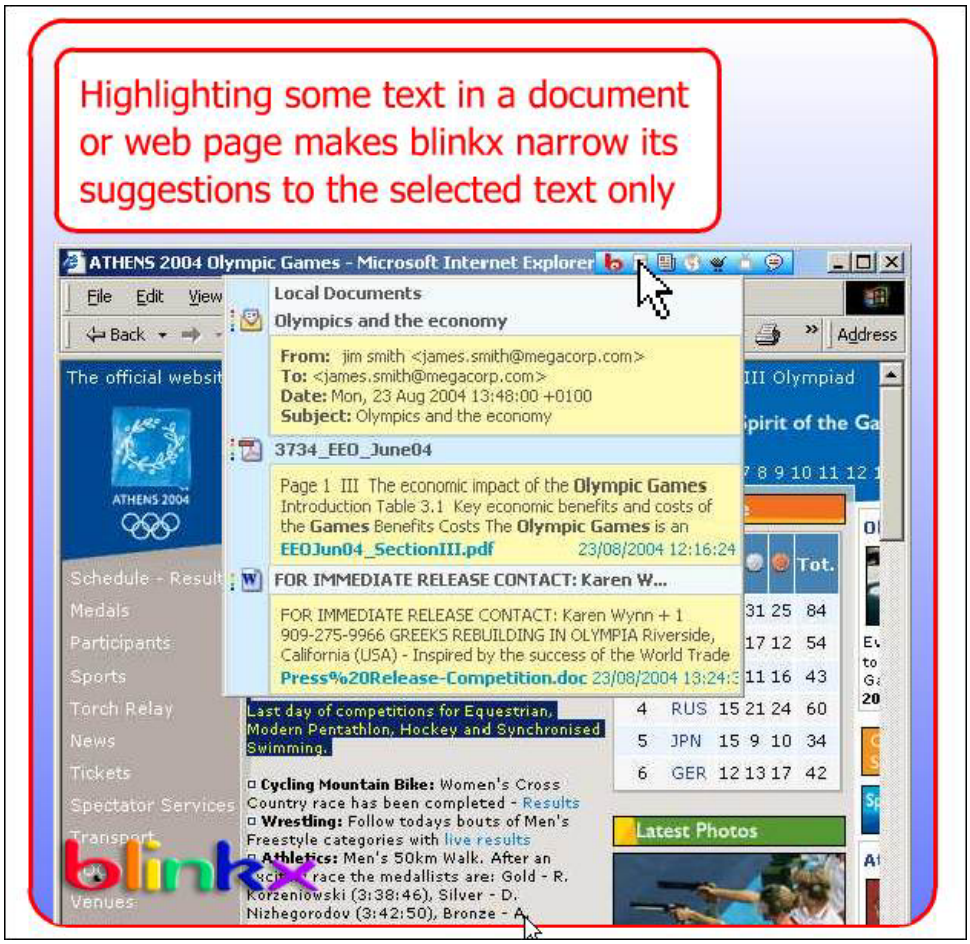
The E-Learning Framework (ELF) is a work-in-progress but it is, in effect, a strategic statement of how key international actors perceive the shape of e-learning systems to come. As the Framework becomes populated with resources, examples and reference implementations we can but hope that the abstract will become more concrete.

When placed in the context the ELF vision, some of the examples of components and services above suggest that the platform(s) from which these services and components could (or is that should?) be almost invisible. A far cry from the situation we have today with mainstream MLE/VLEs being far from invisible.

Even when the VLE is removed from the equation most services are currently consumed via a browser, which of course comes complete with its own interface furniture. However, there is no reason why services could not be 'consumed' via a desktop or rich client which would be consonant with the personal learning environment being promulgated by the Distributed e-Learning strand of the JISC e-Learning Programme.

> *... develop e-learning tools for learners working independently in a Personal Learning Environment. However, the tools should also be suitable for use within an institutional context (to complement other institutional systems such as a Virtual Learning Environment); or to access and interrogate local, regional, national or international collections of resources.*
>
> *(Source: http://www.jisc.ac.uk/uploaded_documents/Circular3-04FINAL.doc).*

One example of next generation tool/service which has a discrete if not quite invisible presence and which can contribute to a personal learning environment, but yet can interact with the web without being browser-based is Blinkx (http://www.blinkx.com/overview.php). Blinkx maps users' interests to potentially relevant local and network resources, e.g. documents, news, Web sites, Weblogs, products, video clips. The Blinkx interface automatically inserts itself into the toolbar of target applications, e.g. wordprocessor, email client, browser. Shown below is Blinkx supplementing information on a web page with associated documents already stored on the users' local system.



Once again though, some of the above may be perceived as a nightmare scenario by some commercial interests. What do you mean you want our platform to be invisible? What do you mean you only want to use one or two of our services? You want to use a public domain object repository and not our own? What about our branding?

Let's consider the last of these.

There are already open source and commercial components which add functionality to web sites, weblogs etc. For instance in Auricle (www.bath.ac.uk/e-learning/auricle.htm) we manage our syndicated feeds using one XML parser whereas in another of our sites we use the freely available CaRP RSS engine (http://www.geckotribe.com/rss/carp/) to drive the same function. The CaRP solution contains a discrete branding statement which is totally unobtrusive. Of course carried to extremes less discrete branding of services could become aesthetically 'challenging', e.g. loud music leads to equally loud animated presentation with bold statements about "this service comes to you courtesy of …"

There are those who view portals plus services as the way forward.

> *In theory, a portal should sum up all on-line resources of an institution, including the Virtual Learning Environment(s) (VLE) ... Trouble is, many VLEs already have functions that are quite similar to what a portal would provide- usually just not as powerful and as flexible as those of, for example, uPortal ... VLE functions like calendaring, chat, authentication or group management can not easily be taken out of VLE software... Ultimately, the channel idea at the heart of portals ought to be flexible enough to push content in and out of VLEs. Who then gets to publish the user's favourite page that displays all that content is perhaps not so important ... If channels are made available in a standardised format, there is no reason why Colloquia couldn't capture and display it.*
>
> *(Kraan W, 2002, CETIS, http://www.cetis.ac.uk/content/20021126163827)*

There are some who would argue that there is no problem since all a portal needs to do is connect with an underlying VLE. I can't agree. Current major league VLE's 'lock in' services. The vendor is selling you the whole package or nothing at all. Whilst there is certainly an ageing business logic behind this we need to rethink whether this is sensible from a consumer perspective. The MLE/VLE marketplace of the future should, arguably, be more component and discrete services oriented. Maybe, just maybe, the advent of portals will help rewire our thinking.

Of course there is then the question of portal lock-in. What do you mean these services will only work with UPortal? What do you mean my services must be developed using Java?

The irony in all of this is that it's only now, after a few years of experience, that we are all in a better position to make informed decisions and it's gratifying to see the quality of JISC thinking about what's required. The problem is that some institutions at least have been doing more than gathering experience and have made a full-blown strategic commitment to products which represent only one way of offering e-learning. How many have thought about exit strategies? How many exit strategies will work? How many will now be willing to allow 'different e-learning tools' that don't fit into the licensed, and therefore supported, vendor's product?

It's also ironic that we are finding functionality in open source solutions, like Moodle, that mainstream systems haven't managed to adopt yet or for which they provide limited functionality, even in enterprise systems, e.g. shareable bookmarks, journals, configurable RSS feeds. I suspect that institutions are giving primacy to the apparent strength of the management features being promoted by commercial MLE/VLE systems with a pedagogical flexibility coming a poor second. Emphasis on the apparent managerial strengths of a system of course comes fairly easy to those for whom the perception of e-learning is of content delivery and tight integration with centralized management information systems. There is considerable pressure within institutions to 'lock in' to enterprise solutions in the belief that this will be more 'efficient'.

Conclusion

My opening statements raised the spectre of an e-learning monoculture developing unless we reduce our dependency on a few mainstream commercial players. The JISC et al vision plus work taking place in the international open source community suggests that this is exactly the wrong time to be 'locking in' to any one solution. Unfortunately, key decision makers within institutions may not be receiving the message and place greater emphasis on bringing

themselves into line with the enterprise decisions already made by other institutions in their regional or collaboration cohort.

I finish with the question in the title of my paper - E-Learning Flexible Frameworks and Tools: Is it too late?

References and Resources

Auricle the online journal of the e-Learning at Bath team
(www.bath.ac.uk/dacs/cdntl/pmachine/morriblog.php)

CETIS article Open uPortal technology gains ground in the UK
http://www.cetis.ac.uk/content/20021126163827

Cornford J (2000), The Virtual University is (paradoxically) the University Made Concrete, Information Communication and Society Volume 3, Number 4, December 1, 2000, pp 508 – 525, Routledge
http://taylorandfrancis.metapress.com/app/home/contribution.asp?wasp=80nntpuwylm4m5rhwbq6&referrer=parent&backto=searcharticlesresults,6,8 also at
http://virtualsociety.sbs.ox.ac.uk/pick/pick6.htm

JISC E-Learning Technical Framework and Tools
(http://www.jisc.ac.uk/index.cfm?name=elearning_framework)
Service Oriented Frameworks
http://www.jisc.ac.uk/uploaded_documents/AltilabServiceOrientedFrameworks.pdf

JISC Circular 3/04: Projects to Develop E-Learning Tools for Learners and Teachers
http://www.jisc.ac.uk/index.cfm?name=funding_03_04

JISC Circular 3/04 - E-Learning Tools for Learners and Teachers
http://www.jisc.ac.uk/index.cfm?name=etools

JISC Information Environment Development Strategy 2001-2005
(http://www.jisc.ac.uk/index.cfm?name=strat_ieds0105_draft2)

The Sakai Project http://www.sakaiproject.org/