# Information management and e-learning
## Some perspectives

John Akeroyd

*Learning and Information Services, London South Bank University, London, UK*

## Abstract

**Purpose** – To provide a review of the interface between e-learning, digital libraries and learning content.

**Design/methodology/approach** – A review of current thinking and activity surrounding the delivery of content in e-learning systems. Some analysis of information concerns and commentary on future scenarios.

**Findings** – The paper investigates the reality of information management in e-learning practice. It looks at types of information extant in systems and analyses links between (virtual) learning environments, digital libraries and web content. It examines the potential for reuse of material in a university context and the supporting standards and technology.

**Research limitations/implications** – Looks particularly at UK and US context but also has an international dimension.

**Originality/value** – It brings together a disposable set of issues to provide a discursive but practical summary of the topic. It will be of value to an information manager faced with managing content in a learning organisation.

**Keywords** Computer based learning, Learning, Information management, Open systems

**Paper type** Conceptual paper

## E-learning now

E-learning is an ill-defined concept, subject to wide variation in practice, but which nevertheless has become an established component of education delivery worldwide. At one extreme it implies the use of the web technology to facilitate the whole cycle of learning from initial sign-on to final certification, with a range of operations in between, and with no, or little, physical interaction with the host university. This replicates the distance learning model and has parallels with the operations of distance learning universities, which sprang up in the 1960s, though they too had earlier roots in the external degrees of the major UK universities. At the other extreme, and much more commonly, e-learning in many university and college contexts is a hybrid of "traditional" face-to-face teaching, with electronic delivery of content and services built on and, where appropriate, with administration and related tasks also being web based – so called blended learning, in a mixture of the old and new.

It has also been correctly described as a process and not as a technology or a product. But to enable these interactions, generic systems have been developed virtual learning environment (VLEs) in the UK, and learning management system (LMS) in the USA which provide a technological, parameter driven framework to allow individual academics to develop and deliver learning content, to interact with students and to

facilitate open discussion. They will also generally support a range of administrative functions relating to the course. In the UK, at least, the VLE concept has been further enlarged to encompass other institutional functions such as student house-keeping, bursary, timetables and so on, leading to the concept of a managed learning environment (MLE). The MLE remains a novel and somewhat elusive concept, while VLEs have become established as full-blown commercial products with industry level support, regular software upgrades and product enhancement. They are a staple function in many universities.

However, the pedagogic aspects of e-learning are perhaps less well understood and appreciated than the IT which underpins it. Again, at the extreme, implementations of VLEs have sought to transpose the methods of traditional learning and teaching into the web domain so that existing learning materials (content) or citations to printed materials are delivered through the web equivalent of course notes, hand-outs, and the like. Students are directed to assimilate that material and undertake exercises based on it. The VLE can also be used to interact with students to provide a level of online support.

This model is perhaps the most common, endemic in universities at the moment, but it could be argued is a poor use of the potential for e-learning (Stiles, 2000). At the other end of the spectrum is what is referred to as "content-free learning", which essentially implies a communal approach to learning whereby students are facilitated to interact, investigate and improve mutual understanding. This more radical approach has some parallels with the development of knowledge communities supporting scientific communication and does not pre-suppose any given text, albeit the interactions themselves could, in due course, result in a knowledge base capable of being stored, searched and exploited.

Indeed, to understand the role of content in the VLE we really need to understand the pedagogic processes which apply:

> There are a range of learning theories and learning processes in contemporary education informed by a variety of theorists and encompassing a variety of different forms and methods. Contemporary learning theories provide guidance (to e-learning development) which can extend beyond the surface learning which appears to be characteristic of the transmissive modes of teaching that are associated with conventional courses (Oliver, 2004).

Content is most prominent in "behaviourist" learning, which is characterised by knowledge transmission and acquisition, equates with traditional lecturers and is also perhaps the easiest to create within the VLE. Other learning processes are less content dependent, perhaps implying more interactivity and engagement: learning by doing. We can differentiate between learning which is essentially about the acquisition of knowledge, and learning which is about making sense of things and interpreting and understanding reality in a different way. It is the difference between knowing "that" and knowing "how" (Ryle, 1949). Ultimately it is the idea of social learning which hinges on social interaction, so called learning communities or communities of practice. Smith (1999) also quotes Wenger, the apostle of situated learning, whereby learning is not seen as the acquisition of knowledge by individuals so much as a process of social participation "The nature of the situation impacts significantly on the process." Here content might play no part at all, albeit the consequence of the activity might, in itself, be the creation of knowledge – though whether of any contemporary value will be addressed later.

A further analysis is provided by Maccoll (2001) who quotes Mason (1998) in identifying three different approaches to e-learning design:

(1) *Content and support* – which, in essence, is the traditional model of delivery whereby content is static and central to learning and backed up by conventional or off-screen support.

(2) *Wrap around* – which implies higher levels of interaction with the content itself and which, in turn, may become more dynamic. It equates with the cognitive learning theory – the "knowing how".

(3) *Integrated* – which employs a "community of learning" approach whereby assignments become collaborative and support is mutual, leading to the possibility of changed roles (students as teachers/teachers as students) and the creation of new knowledge.

### E-learning content

So, in order to address the role of information management in this new, emerging educational landscape we need to examine the nature of the learning content implicit in the above models. Content itself could be said to form a spectrum including at one end highly structured pre-existing traditional published material, to a loose association of ideas within a loosely structured knowledge base at the other (see Figure 1).

Content could be categorised as:

· published, structured and quality material such as library content and similar works within an established quality framework;

· less structured material such as course notes, handouts and the like which may vary lecture to lecture, is poorly structured and not subject to any bibliographic controls; and
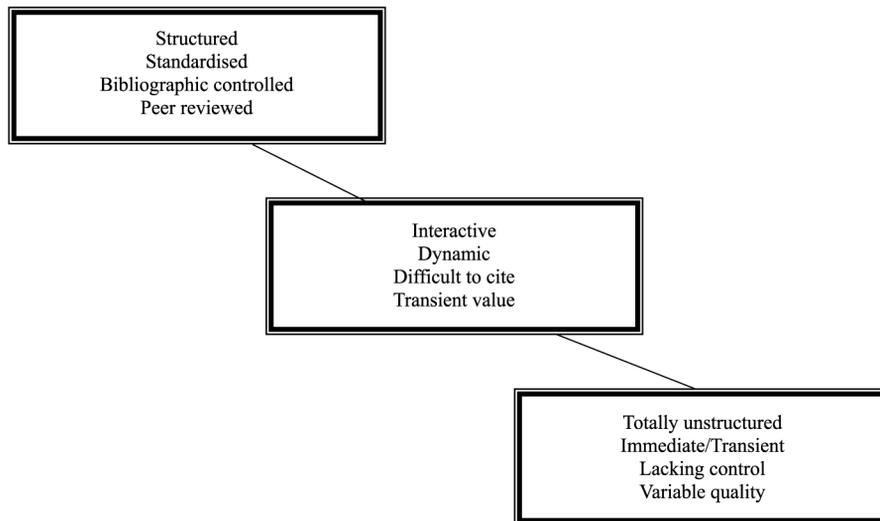


**Figure 1.**
Document classification

- totally unstructured material which might emerge from discussion fora or e-mail lists and which is constantly changing and being amended – we need to imagine interactive e-mail debates or even web logs.

Of the e-learning delivery models outlined above, the problems deriving from the use of traditional materials within VLEs (and "traditional" here is used also to embrace any source of verifiable quality – electronic or not) are now well rehearsed if not completely resolved. The chief problem can be simply expressed as: a student is working in the VLE and is recommended to read a given article which is within a licensed database; how can this be enabled with minimum effort and minimum confusion on the part of the user? Underlying this question are two further points:

(1) The problem that some such library content repositories are dynamic, with ever changing identifiers (URLs).

(2) Remote repositories may well have different security access systems from the main university system itself, i.e. different levels and types of authentication.

The simplest solution to this problem is to copy across content into the VLE domain itself, so that there is always a residual accessible version of the published article for students to use. The copyright restrictions are obvious and hence, as a solution, it is unlikely to be universally applicable, even if fairly common.

Much research has been given over to technical solutions to seamless access to content. Projects such as Angel (2004), Devil (2004) and Olive (2004) have all looked to establish methodologies for persistent resource links or techniques for deep-linking which will resolve the VLE/Library conundrum. All are viable to some extent and, depending on the target content, are likely to have some variation of the open URL standard or other federated/distributed search enquiry to broker the different content repositories. These problems are comprehensively detailed in a white paper published by the IMS/CNI (McLean and Lynch, 2003), which notes both the low level of interconnections between resources on the net and, even where there is interconnection, the sequence can be clunky and prone to failure. In fact, many or most of the resource repositories are "autonomously managed – they have been developed independently with particular service and business goals". This will continue until such repositories have service levels that will allow resources to interoperate through the local article resolvers, and there are solutions to the interoperability of metadata standards in distributing the query. Such solutions may not yet be perfect, but they are viable ways forward.

At the technical levels, standards have emerged for the interoperability of e-learning resources and the VLE developers themselves have created systems that will interoperate with the various resource repositories or library systems. Project Easel, for example, examined opportunities for cross-European searching of e-resource banks in order to formulate new e-learning courses.

Similarly, the authentication/authorisation issue has been subject to research and development with the most prominent, current, development being Shibboleth (2004), which, through its very large scale backing of global companies seems likely to succeed.

**Locally authored learning content**

In practice much of the material populating VLEs is as likely to emanate from individual academics or related developmental groups as it is from commercial or licensed resources – indeed, most of the literature and anecdotal evidence suggests that this is the most common method for delivery of content at present. The material, being locally owned, can be delivered within the VLE without more ado. The only information management issue that then arises is whether to retain and archive that material, and for what purpose. Very little appears to be written on the topic (Lynch, 2002, seems the only one to have addressed it).

There are basically two reasons why you might wish to retain locally produced content. The first is the potential to reuse or re-purpose material, whether within the institution itself or across similar institutions or consortia. The second is to provide an institutional archive. Dealing with the second issue first, as it is not strictly central to this paper, institutional repositories have been posited as a requirement for universities in order to preserve the intellectual record of the institution. The purpose of such a database could be multiple, but would inevitably encompass the normal archiving function for any large organisation. It would also increasingly encompass materials which otherwise might have been disseminated through other channels, or discarded. These might range from course notes, e-mail logs and pre-prints of scholarly articles, as well as the normal run of committee papers and the like. In the context of e-learning it makes sense to preserve the substance of an electronically delivered course in that, as Lynch points out (Lynch, 2002), in due course this may be an integral part of any legal or similar challenge which students may make to a university ruling.

The problem at the moment with the notion of institutional repositories is that they potentially perform so many roles that it is difficult to see whether we are indeed talking about one single repository or potentially a number of repositories with different but overlapping and interlinking functions. For example, there could well be an administrative repository, a scholarly output or research repository, and a learning resource repository. The differences here are not so much the technological infrastructure as the way in which the material is held and described, given the different purposes to which it might be put. Perhaps the most quoted example of an institutional resource repository is the D-Space initiative of MIT, which has sought to disseminate the support material for its curricula offering, not only within the university itself but globally.

One concrete example of document repositories might be course or module information, such as course specifications and learning outcomes and assessment criteria. These are likely to sit easily in a structured database accessible by course identifiers and link with relevant student records and administrative data. They have more in common with document systems than either digital libraries or e-learning content, but nevertheless contain material which is frequently sought.

A second rationale for archiving and storing learning resource materials is, in some ways, easy to argue – it is the simple notion that such material can be re-used or adapted for other institutional purposes by other course developers. It plays on the idea of learning objects, whereby learning content is broken down into discreet amounts of learning or material which can be brought together to deliver different learning outcomes. The re-use concept is an underpinning philosophy of much of the e-learning debate; it has also generated research programmes, standards work (SCORM (2004)

derives directly from this approach), and the potential for an open market for such material.

The advocates of re-usability argue factors such as cost efficiency, consistent quality, rapid development and improved learning quality. The idea is that, in time, there will be an array of quality learning resource objects within distributed repositories which can be searched, retrieved and re-purposed into a new course. The process raises issues of object inter-operability, granularity, distributed resource discovery and intellectual property. It has largely been concerned with the development of new resources rather than the discovery and reuse of existing resources (Oliver, 2004). It has to be said that there is no long history of the reuse of learning materials, at least within UK universities where academics can be very territorial about their curricula and support material, and the extent to which this is happening throughout universities, or potentially might happen, is perhaps a moot point. A recent report from the UK HEFCE (Glenaffic Ltd, 2004), which, in turn, was reporting on a sector-wide consultation on e-learning, noted that it may be that the approach is more applicable in a training context.

There are other potential barriers to re-use in the university context:

- To be effective, learning resource material needs high quality metadata, which is not only descriptive, but is indicative of pedagogic outcomes. The creation of this metadata is no simple task and it is unclear whether the expectation is that this will be done centrally, e.g. by librarians, or by individual academics themselves. If the latter, there is certainly a significant training requirement here and it is unlikely to be welcomed by hard pressed teachers. Oliver *et al.* (2003, p. 38) reports on one project where the metadata was created by contributors – "Even though the inclusions of the metadata was a contractual requirement for the developers, there were a number of discrepancies observed in the scope and extent of the metadata for the resources ..."

- In searching for new material there is no evidence that academics would normally turn to such repositories. For example, the use of services such as the RDN remains minimal and the evaluative review of the DiVLE project (Brophy *et al.*, 2003, p. 24) reported that "many academics use Google as their primary source of information".

This situation is unlikely to change quickly, though there are relevant developments which might presage change. For example, the availability of free quality content is becoming common so that academic effort might shift more towards learner support than the mechanistic concern about content production and delivery. The already mentioned decision by MIT to mount all course materials with free access is indicative of the direction as is the service Merlot (2004). An alternative scenario has been the growth of both commercial and national learning resource repositories that can feed the development of local interactive resources. Examples of these might be the NLN (2004) in the UK (this is aimed at college level more so than university level and provides small episodes of learning to maximise flexibility in delivery within e-learning programmes), the offerings of Pearson Education, material brokered by VLE vendors such as WebCT or Blackboard, and the outcomes of the JORUM (2004) project. However, the uptake and commercial viability of these services and repositories is an unknown and, though much investment has gone into the development of some of the

more commercial enterprises, they do depend on the development of the more interactive mode of e-learning delivery than the didactic approaches initially described. And, as Stiles (2000) points out, there are clear contradictions here, with many seeing content as a future market with others proposing opposite models. An unresolved question in this is: "Is it an institution's content or the educational experience it provides, which affects competitive advantage?"

So, should institutions be building learning resource repositories to facilitate institutional resource sharing? The standards are there for this to happen and there is much experience to go by, but the organisational and cultural issues are perhaps less well rehearsed; for example, who should own such repositories? Should they be centrally managed with consequent efficiencies or distributed to faculties? It certainly requires an unambiguous institutional strategy in order to progress, as many academics would regard lodging their materials with an institutional server as peripheral, if not downright unacceptable. But if universities are to capitalise on their knowledge resources then the development of learning repositories is a clear necessity. It becomes one of securing faculty ownership, ensuring common levels of interoperability, and putting in place relevant reward mechanisms to get the whole effort moving. It contrasts with current practices identified by McAndrew *et al.* (2003) where much content is being stored within the VLE itself or in local repositories and migrating this to a control repository is in itself a significant challenge. The alternative is the use of internal harvest mechanisms or agent technologies to create virtual collections, which might overcome some of the resistance to centralised repositories.

In any event, repositories can be structured along faculty lines and, as long as standards of metadata are in place, then inter-discipline sharing becomes possible. Building repositories is perhaps, in itself, not overly complex. But to have maximum value they will require the attention of a mixture of experts including librarians, information managers, learning technologists, IT staff and teachers, and the policies that will need to be addressed will include:

- *Rights management* – unless individual academics can see some kind of return for their efforts, they will be unwilling to deposit content, and may prefer to go to a commercial group.

- *Archiving policies* – Lynch (2002) makes the point that, even though a course may have ceased to run, there may well still be a need for an archive so as to comply with appeals systems, etc.

- *Promotion and exploitation* – in that the individuals may well perceive alternative resource banks as being more appropriate, easier to adapt, and so on, while the local repository may well be found to be facing increasing competition both with commercial and consortial efforts.

- *Provision of good metadata* – this also assumes that the purpose of metadata in this context is specifically aimed at the reuse within learning resource repositories, while in many ways metadata also has to serve the traditional function of metadata in indicating the availability and duplicability of the item itself – the question is, "which audience is the metadata being created to serve?"

- Finally, although content may be potentially reusable, divergence in pedagogic practices can imply the *need for a significant refocusing* to ensure the transfer of outputs from one university to another.

Systems will also need to be easily navigable for course creators and provide quality outputs, including alerting systems that accurately profile user needs.

So, the question remains as to whether we will see a number of small institutional learning resource repositories which may not, in effect, pay their way or whether there is a move to more consortial approaches or whether, in the end, the commercial sector will win through.

## Resource lists

Bridging learning modes (1) and (2) described earlier are reading lists or, perhaps more correctly, resource lists, which, *inter alia*, provide direction to the student as to what to assimilate, but also advise libraries and bookshops and others of student needs. These also translate into the VLE and the digital library domain and enable the tutor to provide direction to core resources, whether web-based or print, to circulate these resources in whatever way is needed, and to direct central and support units as to what is happening. Reading list management systems (RLMs) are shared and distributed databases that can provide a direct link between library catalogues and the VLE, and vice versa. For preference they should be integrated with both, in effect a subset of the catalogue of resources identified viable as appropriate to a specific course. They, too, need ownership, both by tutors and by libraries to ensure currency and relevance.

Such resource lists, in themselves, might create a dynamic metadata repository key to a university's course offering. Current reading lists are notoriously static documents, often dated and rarely fit for purpose. The opportunity to create a dynamic, shared and annotated list, as a bridge between resources and learning is one which, in the end, may prove to be more critical than many other developments we have noted previously.

## Communities of practice

The final model in the Maccoll-Moore analysis is the more radical e-learning scenario where new concepts are created through the interactions of the virtual learning community. This does not tend to lend itself to any obvious information management analysis other than a comparison with knowledge management and similar systems. In such a dynamic scenario it is likely that any repository will be created in real time, in effect a live archive of course history.

Lynch (2002) talks about student information and published information being co-mingled as the outputs of this kind of learning. It seems more likely that this approach to learning will be either complementary to, or supplemented by, some of the other models earmarked so that there will be an intermixing of dynamically created commentary together with the texture of material itself. It is also likely that disciplines themselves will vary in the extent that they take up any of these different options, in that e-learning does not necessarily suit every specific discipline.

## Summary

In summary, much of the debate over this topic has been at a technical level and is focussed on the specific issues of ensuring interconnections between resources identified in the learning domain and those held in learning resource repositories and elsewhere. It should not be forgotten that much learning is unstructured and open, and there is no doubt students within HEIs will continue to need library portals to enable access to the totality of information resources that they require and that universities

can supply. In the same way, tutors are unlikely to be bound by the constraints of institutional commercial learning resource repositories, and will continue to search in an *ad hoc* way comprehensive library collections. Thus content stretches from the unstructured to the dynamic and free form, while learning can be precise, directed and dependent on the one hand and open and content free on the other. Information management systems will be biased towards clear learning outcomes, heavily controlled and structured, while learning will always be a more complex and personal act, and how ever good the system will be difficult to emulate.

We have seen that most of the research and development to date in the interaction between information and e-learning has been concerned with the citation of electronic material held within licensed databases and the utilisation of existing library collections. Paradoxically, most of the actual implementation work to date is probably more at the level of individual academics creating content for individual web sites. No doubt, in due course, this gap between research and practice will gradually be bridged as linking technologies become simpler and more commonplace, and there is a new and emerging generation of teachers who are more web adept and more likely to be using borne digital content. Whether this happens within the confines of an e-learning structure, such as a VLE, or whether, as is probably often the case, it is a matter of individual teachers pointing their group of students to their content is possibly a moot point. It probably depends on the nature of the institution in question and the extent to which it favours such corporate approaches or not. It may also be an issue to do with level and discipline mix. Certainly, in the recent past, much of the developmental effort in the UK has gone on at the sub-graduate level where management may be much more centralist than that at prestigious, and therefore somewhat anarchic, universities.

Perhaps the future reality will be something very different from what we now know and understand. It ought to be about choosing the relevant learning process rather than being constrained by any given system. To repeat the point we still know very little about the pedagogy of e-learning and it is perhaps of no coincidence that this has emerged as a new action line in the UK's national information initiatives. In the commercial sector e-learning is certainly being looked at as an aspect of much wider strategic developments which also includes corporate communications, knowledge transfer and other foundation stones of a learning organisation so that delivery moves on from the relatively "flat" learning material now extant in library databases or VLEs to the much wider use of sound and images to support understanding and communication.

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