## The UCI Distance Learning Center

## The William and Flora Hewlett Foundation

**Sorting Through and Sorting Out: The State of Content Sharing in the E-Learning Industry**

Meeting report by Reid Cushman

**PREFACE**

**About this document.** On 22-24 September 2002, a group of 22 education and information technology specialists gathered on the campus of the University of California at Irvine (UCI), for a symposium on the state of educational "content sharing." (See participant list.) The meeting was sponsored by the William and Flora Hewlett Foundation Education Program and the UCI Distance Learning Center. This paper summarizes the themes that emerged from that gathering.

Most papers can be characterized as collaborative, but this one is particularly deserving of that adjective. The presentation here is an attempt to synthesize the ideas of all the participants, expressed in numerous conversational and written exchanges pre-, during and post-meeting. While every effort has been made to present the range of views, surely not all participants would agree with the emphases and interpretations herein.

This report includes a hyper-linked bibliography and footnotes for additional web-based material on e-learning topics. Links are provided for the reader's convenience only, and represent neither an endorsement nor a guarantee of the accuracy of the content of the associated sites. Comments and questions about this document are welcomed, however, and should be directed to the author or the meeting sponsors.

**About the meeting topic.** The computing and communications technologies embodied in the World Wide Web allow very low cost, nearly instantaneous delivery of digital content of all kinds. As such, the Web represents an unprecedentedly powerful tool for the sharing of educational materials that can be rendered in digital form – to the end of what has come to be called *e-learning*.

With a virtual world closing on 10 million web sites and some 500 million users,[1] it may seem odd to speak of shortages or slowness. Despite such expansion, the WWW remains something of a disappointment to educators. Those hoping for transformation of the educational process have yet to see it. And a significant corpus of digital educational content – preferably available free or at least at low-cost – is still mostly a dream. More and better digital *content sharing* would be a means to serve these ends.

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[1]See statistics of, among others, "Web Characterization," Online Computer Library Center at http://wcp.oclc.org/ and "The World's Online Population" at http://cyberatlas.internet.com/

Our focus on content sharing in the *e-learning industry* may require clarification, lest it mislead. There is a range of "productive capacity" out there, from individual students and instructors to giant educational publishing and software companies, all of whom can generate digital (or at least potentially digital) educational materials. Only the latter are recognizable as industries in the usual economic sense, and within that context e-learning is only one part – often a small one – of educational product lines and markets.

It is equally important to remember that e-learning is a somewhat misleading segregation as it applies to pedagogy. Education efforts today tend to "consume" electronic tools as complements to rather than substitutes for older methods. Paper reading materials and on-line content are intermixed; face-to-face sessions supplement purely on-line contact, as geography and time permit. Such mixing and matching is sometimes called *blended learning* or *hybrid teaching*, and is seen in both conventional institutions and on the most advanced "virtual campuses."[2]

While these may seem like merely definitional issues, the boundaries of "production" and "consumption" of digital content set the foundations for the central questions addressed by the meeting participants:

- How do we get more and better educational material on line, available to apply to a range of teaching environments?

- How do we get what is available to be efficiently used?

The latter question particularly is motivated by a widespread feeling that the process of teaching itself remains broadly inefficient, with too much of a "cottage industry," do-it-yourself orientation among educators, particularly those in higher education.

**Background for the discussion.** This paper assumes some familiarity with the technology and terminology of e-learning. Readers for whom terms such as *reusable learning object*, *metadata tag*, *platform interoperability* or *content repository* are entirely new – or for whom abbreviations such as SCORM, LOM and LCMS are a mystery – may wish to consult the overview provided in E-Learning Technology and Terminology.

It is also assumed that readers have some familiarity with the current range of educational content – from paper *coursepacks* to digital *cartridges* – available to K-12 and higher education consumers. An overview of that topic is provided in Conventional and E-Learning Content.

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[2]Conventional institutions have adopted these methods to save costs, conserve scare classroom space, and meet students' demands for more flexibility. Distance education providers have included older methods because students like them, and because they still work well. See, e.g., John Daniel, "Lessons from the Open University: Low-Tech Learning Often Works Best" *Chronicle of Higher Education* (7 September 2001) at http://chronicle.com/free/v48/i02/02b02401.htm and Jeffrey R. Young, "'Hybrid Teaching' Seeks to End the Divide Between Traditional and Online Instruction" *Chronicle of Higher Education* (22 March 2002) at http://chronicle.com/free/v48/i28/28a03301.htm

## INTRODUCTION: ANGLES ON THE PROBLEM

Meeting participants pondered the "content sharing problem" from many perspectives – including the perspective that it might not even be a problem. Among the components of the question considered, in addition to the nature of digital content itself: production and delivery technologies, technical standards, pedagogy, business models, organizational structures and academic cultures.

As with any other application leveraged by computers and telecommunications, technologies and technical standards for e-learning are changing rapidly. It is possible to do things easily and cheaply today – such as in the area of video transmission – that were technically or economically prohibitive not that long ago.

Everyone wishes it were even easier and cheaper, of course. And everyone wishes, as one way of making things easier and cheaper, that technical standards for processes were here today, instead of under development for some long-off tomorrow. But the technical dimension was not, in general, viewed as the major impediment here.

On the other hand, every participant agreed that with the introduction of new forms (and delivery vehicles) for content, pedagogical approaches would need to change as well. "Bolting on" new content to old methods, to use a now shopworn slogan, decreases the value of e-learning content, and undermines new business models that would push in the direction of investment in the new technologies. But there is still little data on the cost-effectiveness of alternative approaches, and a pervasive organizational-cultural resistance to process change.

That organizations and cultures shift more slowly than technology is hardly a remarkable conclusion. Nor is it new news that education generally (and higher education particularly) suffers from cultures that are particularly resistant to change. But there is a large gap in understanding within those cultures that is particularly worrisome: a gap between those that develop the technical tools, and the on-the-ground instructors and students into whose hands the tools are to be deployed.

Put differently, for all the production technology improvements on the "supply side" of digital content, we still know relatively little about the "demand side" of the equation.

Our meeting began with a focus on the supply of tools – notably the tool called digital content, assumed to be under-used for various reasons. It ended with a different focus – directed to the range of problems faced by educators, for which more and better digital content may or may not be an important piece of the solution. Sadly, proponents of digital tools often make their recommendations with only a limited understanding of the precise "micro-climate" into which those tools would be introduced.

By meeting's close, this knowledge gap was seen by most participants as the preeminent problem of content sharing.

**THE LEARNING OBJECT ECONOMY**

**Measuring educational efficiency.**  As with motherhood and apple pie, it is hard to be opposed to efficiency, at least in its most basic econ-textbook form:  Minimizing the inputs necessary to generate a set quantity of outputs – or, alternatively, maximizing the yield of outputs from a given level of inputs – must be a good thing.  But there can be considerable disagreement over whether all inputs and outputs have been properly counted and assigned appropriate values, and over whether the "production function" that relates the two categories is adequately understood.

Efficiency math is particularly hard in a service sector like education.  For example, both instructor and student constitute "inputs," since the efforts of both are necessary to produce learning. Contributions of these labor inputs can be very hard to measure. "Learning" is itself a particularly hard output to capture; our present assessment instruments can permit only very rough approximations.

Even if one believes that we have counted inputs correctly, and that assessment instruments capture something real about outputs, tracing the yield of a small change in an input like digital content, in the midst of a sea of other shifting variables, is a methodological nightmare.  Much of what we "know" about the yield of newer educational technologies – animated PowerPoint slides, say, instead of static overheads and chalkboards – is a matter of faith.

**DIY and educational inefficiency.**  For all the difficulties, there is a widely held conviction that education is conducted inefficiently in many if not most settings.  The problem focus here, as noted in the preface, can be summarized simply: Too much DIY.  And excessive "do it yourself" is thought to be particularly acute in higher education.  Instructors in K-12 environments may have the same I-can-do-it-better-myself inclinations but, so the thinking goes, have less considerably time to satisfy them.

DIY can be inefficient for at least two reasons.  First, most instructors do not have sufficient background in both instructional design and particular subject areas to create high quality materials.  Second, even if they are capable of doing so, it is generally a waste to replicate what already exists – assuming, of course, that one believes what already exists is really adequate to the task, and one is able to find it without excessive costs for conducting the search, resolving intellectual property (IP) constraints, porting the materials to one's content delivery system, and so forth

Commercial textbooks and related products have long been successful precisely because a substantial fraction of the "market" recognizes the efficiency of reuse.  Yet paper content can be a somewhat rigid instrument (not to mention a heavy one) that is difficult to customize to particular needs.  Repositories of digital materials offer the possibility of complete customization, if the content is "modularized" into appropriately-sized learning objects (LO) and adequately tagged for searching, IP expression, and so forth.  Moreover, digital storage offers virtually instantaneous, nearly costless delivery.

**Content problems and remedies.**  Many of the meeting participants are, or have been, involved in the creation of digital content; almost all are, or have been, digital content users.  Yet successful content sharing is the reported exception rather than the rule.  The reasons provided for limited (re)use are probably familiar ones:

- there is not yet much e-learning content out there;

- what there is can be hard to find;

- what can be found is not always interoperable/transferable given the CMS/LMS/LCMS or other platform one is using;

- even if interoperable, intellectual property constraints/uncertainties impede reuse; and

- even if technically and legally suitable, the pre-existing content is often of insufficient "quality" for the application we have in mind.

The litany of "cures" for this problem list is perhaps equally familiar:

- content supply is growing all the time, with both commercial and public repositories beginning to emerge;

- metatagging standards (e.g., IEEE LOM) and improved search tools will make location of content easier;

- content standards (e.g., SCORM) will ensure that content is interoperable, as more CMS/LMS/LCMS platform vendors and content-generators adopt them;

- digital rights management regimes will emerge to both protect creators and make life easier for (re)users by signaling IP constraints; and

- more attention to instructional design issues will come once the more "technical" issues are resolved.

This does not mean the problems are all likely to solved in the short run, only that the solutions are conceivable and, in a few cases, actually visible on the horizon now.

**Free vs. fee-based repositories.**  Some readers, like some meeting participants, may be wary of the language of markets that has been deployed to structure the discussion thus far.  But economic concepts like supply, demand, production and consumption are used here merely as heuristic tools.  Their use is not designed to imply that market paradigms are the only or most productive theoretical approach.  Nor is the intention to telegraph any conclusions about the relative value of conventional market mechanisms – such as fee-for-use pricing – to allocate the "supply" of digital content.

The question of free vs fee-based content distribution was nonetheless a fundamental one for most participants.  Commercial publishers are beginning to generate repositories of proprietary materials, particularly to supplement their paper offerings.  LMS platform vendors like WebCT and Blackboard are building libraries of ready-made plug-in content for their customers.  Free repositories are rarer beasts, and for the moment have fairly limited offerings.

Meeting participants split on whether it must it always be so.  Many noted the considerable costs of producing high-quality digital materials, particularly those that take advantage of new abilities for dynamic, truly "interactive" content.  The WWW is filled with dreary "page turner" content – text and imagery that has been transferred to the web in essentially the same static form as its dead-tree-based forbears.

So here is one paradox:  Costs of content storage and transmission have gone down dramatically.  Production costs have not; indeed, one could argue that they've increased, at least for "cutting edge" materials.  Pricing at the marginal cost of distribution points to essentially free materials.  But meeting the full costs of production requires either a fee-for-use system, or "donations" to the production process.  Who might be part of the necessary donor community is, to put it mildly, an unsettled issue.

**Potential content sources.**  Much "free" research is produced in institutions of higher education.  Could they now be a source of high-quality "free" learning content too?  Few instructors face substantial opportunity costs if they give away their instructional materials.  Most textbook writers labor long and hard for little reimbursement, and only a very select few get much monetary reinforcement.  As one participant noted "most authors are ready to trade royalties for broader influence" given such market realities.

Even so, several participants noted that institutional and individual incentives would have to shift considerably to produce a large volume of free content.  One, reflecting on his own production of materials for on-line supplements to class put it this way: "This is all hard work. I am not getting compensated for this extra work. I do it because I enjoy doing it. But there is a limit on my time."

(A related problem is that the available content authoring tools do not tend to make contributing an easy process for those who have the motivation to undertake it.  Many participants noted that the world will have to improve past simple content generators like Microsoft PowerPoint plug-ins, which provide limited flexibility, and hard-to-learn beasts like Macromedia Authorware.)

Critically, institutions will have to see a greater link to mission, reputation and revenues to reward such allocations of time.  MIT's OpenCourseWare (OCW) project – where WWW access to course materials from across the institution will be provided without charge – may provide a model that other institutions will emulate. Collections like Rice's Connexions digital repository, which will aggregate free content from many sources, may provide another model for a clearinghouse.

Commercial publishers have not gone away, and it is possible that they will dominate much of the digital market as they now do the off-line world.  After initial visions of untold riches, a certain post-dot-com-bubble sobriety as descended on publishers just like everyone else.  Participants noted that for all the activity, it isn't clear how much money is to be made from on-line efforts by anyone.

One participant noted the low usage of commercial repositories of on-line content intended to complement off-line materials.  Only the quiz bank questions in such collections are popular, presumably for students prepping for tests.

**Object-oriented design.**  Pricing issues aside, assume that education overall will benefit from digital tools – at least ones that successfully reduce the time and effort necessary for course preparation, delivery and maintenance.  Standards for content creation, packaging, tagging, and so forth – as those standards come to be embodied in actual products – will be one means to that end.  (As noted, everyone is in favor of standards, but there are always the issues of ideal pace and scope.  We all want standards right now, but only if they are the "right" standards.)

Efficiency in creation, storage, assembly and delivery is also the promise of the "learning object" (LO) design approach that is now at the center of discussions over digital content.  But what, even the most technically savvy are sometimes heard to ask, *is* a learning object?  The usual definitions inform that is a "module," "chunk," "piece" of educational content – but what more than that?

One answer, only slightly more specific is that it is learning content aligned with learning objectives, packaged with assessment instruments to determine if those learning objectives have been met, and with metatags (metadata) that allow the object to be found.
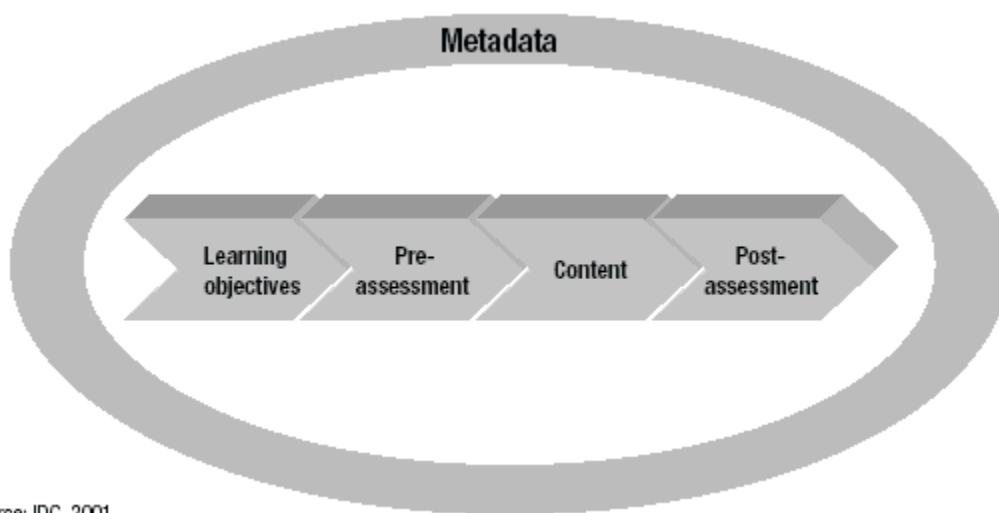


Source: IDC, 2001

**Object-oriented epistemology.**  One can easily see the theoretical appeal of breaking things down into components that are easily and flexibly reassembled – the LEGO approach, as it is sometimes called.  It is as obvious as providing standard-sized bricks for a masonry project.  But object-oriented digital pedagogy can also imply both a positive and normative stance about learning.  Not everyone agrees that all (or even most) forms of knowledge can be decomposed into independent, context-insensitive chunks; and not everyone who thinks it is possible sees it as a desirable educational approach.

Meeting participants reflected this division.  All were united on the proposition that LO should at least be "defined" in ways that promote interoperability across CMS-LMS-LCMS platforms.  Thus technical "packaging" specifications such as SCORM are generally unexceptionable.  Otherwise one has the "Hotel California-Roach Motel" problem of proprietary content, as one participant put it: "You can get your content in, perhaps, but you can't leave with it for another platform."  (Right now, import facilities of commercial CMS-LMS-LCMS platforms are much better than export facilities for the sound economic reason that it is a way to capture customers.)

Beyond that agreement on technical specifications, there was less of a consensus.  For some, it is simply too early for definitions of LO that might "stifle creativity."  For others the task is an impossible one – because each level of education and discipline can have such different instructional approaches and needs.  Indeed, different instructors may have very different approaches and needs.  "It's a family resemblance term at best," one participant observed.

A system that denies this flexibility is doomed to fail, in the view of some participants best counted as LO skeptics: "Unless one has a very limited notion of what a learning object is, there isn't much use for them," one commented, because otherwise they are too constraining of teaching technique.  Of course, constraining this "faculty independence" is a central virtue of objects to some.  Even a great mason should not necessarily be out firing his or her own bricks in a homemade kiln.  Masons that don't know their own limitations should be restrained by incentives or rules.
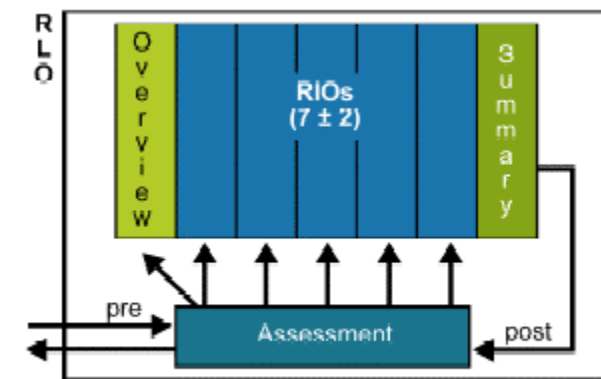


Source: Cisco, 2001

**Technical vs pedagogical interoperability.**  Today's SCORM and its anticipated progeny appear to be setting the standard for content packaging and simple sequencing. Some desire a more robust sequencing standard – e.g., to allow dynamic, adaptive sequencing among modules based on learner performance.  (That may come in future SCORM versions.)  Reflecting the differences over the appropriate objectives for objects, the scope of technical standards beyond the merely "technical" is a matter for dispute.

Some have urged that SCORM and other specifications turn inward and pay more attention to the structure within an object.  These "structuralists" see part of the content quality problem coming from a lack of attention to pedagogical details within the LO (see e.g., Barritt 2001 and illustration on preceding page).  For others, such structuring can only ensure that a greater fraction of content will be viewed as unsuitable for reuse, when it fails to accord with the particular context of instruction.

(Beyond there usefulness to explain what learning objects are, the illustrations on these pages can serve as something of a litmus test for this issue.  In the eyes of some it is a perfectly logical representation of a long overdue structural approach to teaching; to others, to quote one contributor, it is "stomach turning.")

**Attention to pedagogical design.**  The ADL Co-Lab's list of the potential components of educational objects expands slightly on that given above: instructional objectives, content, learning strategy activities, and pre-/post-assessments are the subunits.[3]  As several participants remarked, much on-line content shows little or no attention to inter-relating all these pieces. (To be sure, even content that slavishly follows the model can be of very poor quality.)

Of course, a great deal of off-line content – perhaps the majority – shows insufficient attention to such interrelations.  Several participants who are involved in helping move classes on-line commented on the difficulties of the endeavor, particularly because many instructors have never thought much about the relationship between what they teach and what they want students to know.  "They just teach what they teach ... and that's as far as some have thought about it," one noted, during a meeting break.

One of the principal benefits of more structured design approaches may be in providing an opportunity to ponder such correlations.  In that light, the structural approach that is part and parcel of LO can be a force for pedagogical design improvements no matter how (or even if) the learning content is ultimately "chunked" into pieces.

The counter to this argument, of course, is that there are perhaps simpler and certainly more direct ways to improve teaching than imposition of a design paradigm like learning objects.  Institutions could simply require that their instructors periodically have their lectures videotaped for review by instructional "therapists."  Or have syllabi reviewed for some semblance of structure and attention to learning objectives.

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[3]See, e.g., Academic ADL Co-Lab, *The Objects of Learning* (2002) http://adlcolab.uwsa.edu/lo/index.htm
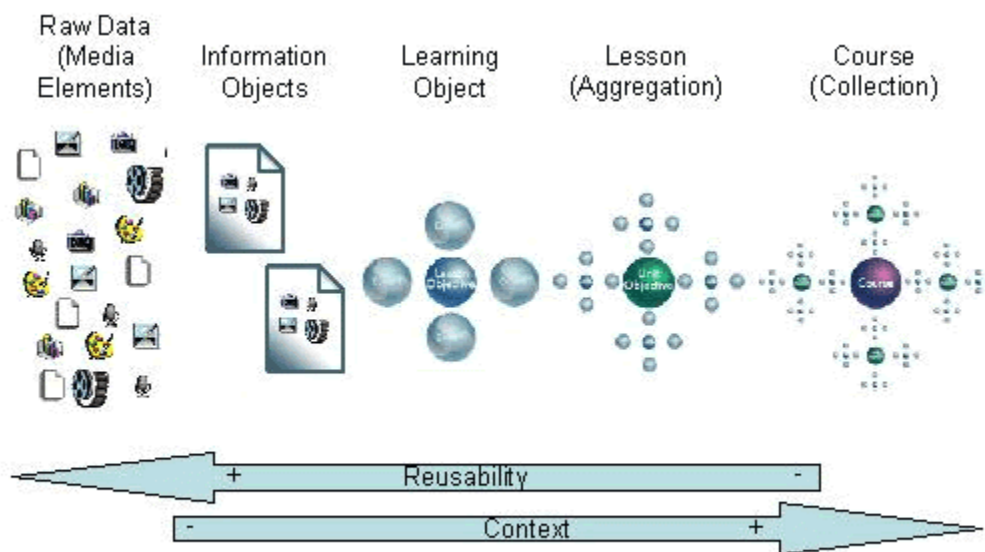
Source: Academic ADL Co-Lab (adapted from Autodesk), 2002

**Share-ability and re-usability.** The "S" in SCORM and the "R" in RLO derive from the core aspiration to promote sharing and reuse of what exists already, instead of "cottage industry," do-it-yourself behaviors. As with objects themselves, defining what it takes to achieve "S" and "R" in purely technical ways – essentially reduced to interoperability potential – tends to be non-controversial.

Sharing and reuse defined more narrowly – as direct adoption, essentially without modification – seems to be the exception rather than the rule. The more basic the learning object, of course, the easier it is to reuse; because it is "raw," there is little or no context to strip away. But less effort is saved by so doing, because one must build one's own context. Alternatively, more comprehensive the notion of object, the less likely it is a fit to a new context, though much more effort is saved when a fit is found.

What is best? One participant characterized this as the inescapable "Russian doll problem": the ideal level of granularity is one that cannot be determined a priori, without knowing the particulars of the learning application. And perhaps such definitions are beside the point. Another participant, deeply involved in building a collection now, noted "the most reusable modules (LOs) are the most bland, un-useful ones," so to 'reuse' will really mean taking a module and modifying it to 'recontextualize' it. This makes IP issues related to licensing content use and adaptation the critical ones."

**How large a "problem" is DIY?** How "bad" a thing is a failure to reuse? It depends in part on one's view of the net value added when instructors have the freedom to construct courses according to their own "narrative." Many instructors consider construction of their own courses to be part of their jobs; indeed, it is what makes them willing to do the job in the first place. Most instructors have in mind a particular context and that does not always lend itself to re-using others' content, at least not without substantial modification.

How much should the DIY propensity be constrained – or should it be constrained at all? That is the question. If we believe instructors tend to make bad choices about reuse, then the level of constraint should be higher.

If, alternatively, we believe that more often than not instructors make the right choices about DIY, then the "cottage industry" mentality is not the problem to fix. The problem is making sure that instructors have all the alternatives in view when making content decisions – the full range of prefab alternatives, as it were – and are aware of their own strengths and limitations as content originators.

Outside of elite higher education institutions, is the fraction of instructors who actually design their own materials small anyway, with the preponderance adopting off-the-shelf materials? The assumption is that off-the-shelf behaviors are more common in higher education generally, more common still in community colleges, and most common of all in K-12 institutions, because of the time limitations for such instructors.

But it remains an assumption. Participants were not of one mind of the constraint issue, but agreed on at least this: we know precious little about the actual behaviors and needs of instructors. We are left to speculate about it – precisely because we have so few "facts" – when we consider what sorts of content are most needed. And speculations about average behavior at a level of education are beside the point. *It is behavior for particular courses at particular education levels that we need to know.*
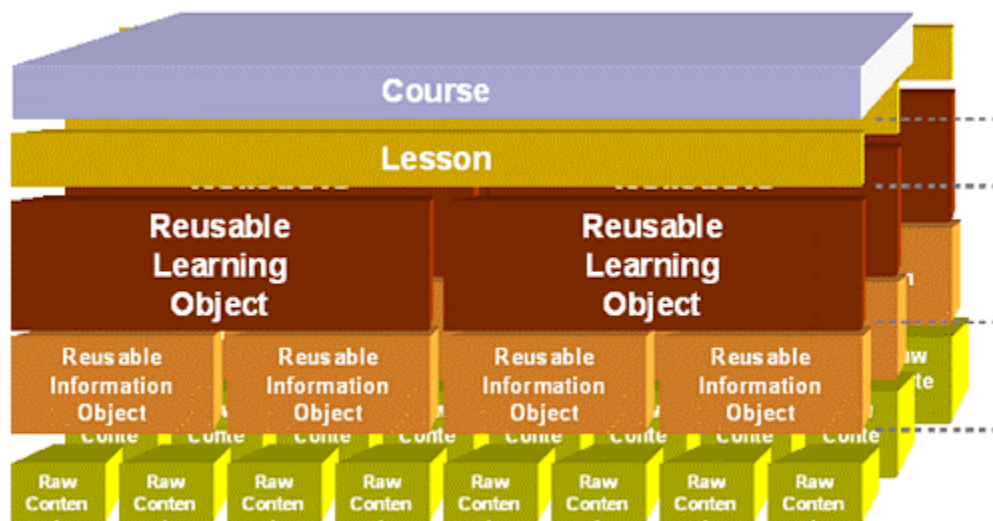


Source: ADL Co-Lab, 2002

**What kind of collection to build?.** When libraries provided access to materials rendered only on paper, geographic proximity to a community of readers was an inescapable organizing concern. Collections could only be as large as the surrounding community could support – perhaps with the assistance of philanthropic organizations – and focused

on that community's needs. (The community's needs would of course be tempered by the preferences of any philanthropists involved.)

Web-accessible digital collections are in many ways the libraries of the 21$^{st}$ century, and the one thing we can be sure about is that geography has faded as a factor. So what is to be the organizing principle now? If there is a role for 21$^{st}$-century philanthropists in creating free as opposed to fee-based collections, who would those supporters be? And what should the priority for their "donations" be?

For example, would collections of public domain "raw" materials and information objects be more useful than finished learning objects? Or, alternatively, would collections of whole courses be more useful? Views on the optimal "granularity" of content varied among participants, with the modal view that perhaps we need all of these, to allow free choice according to one's educational preferences.

The priority question is again one that could be better explored with more information about instructors' needs at various levels of the educational system. Does the optimal collection granularity depend on the level of education, given different standard "production processes"? We believe so, but we don't know.
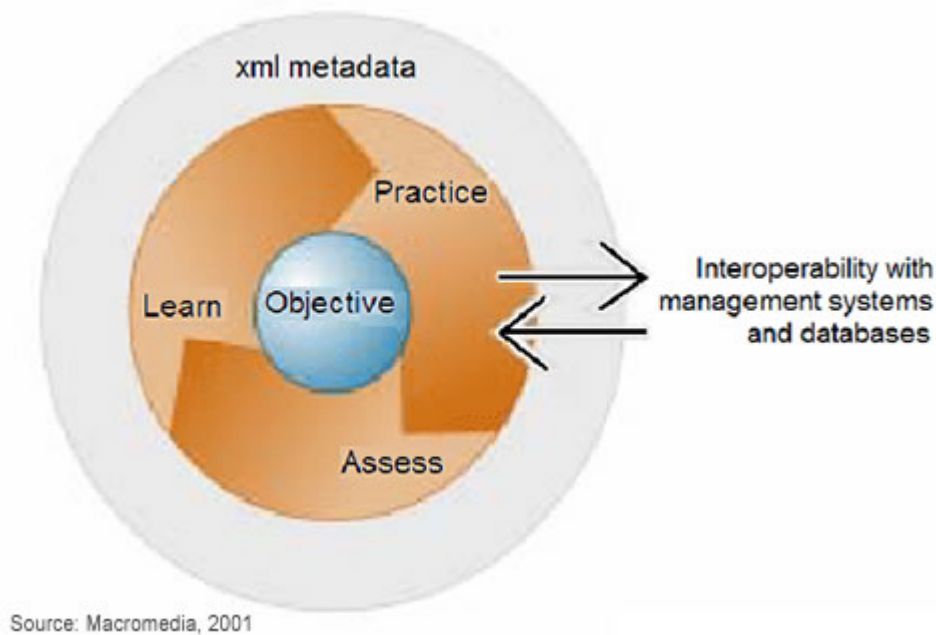
We are left with the commonsense view that there will always be a role for different kinds of collections, with a range of object granularity. As one participant noted, "when video came out, still photographs did not go away, when color photographs arrived, black-and-white ones did not go away – each found a niche." The same could be said of the procession of distance learning technologies from radio to television to videotapes to the WWW, even though the "market share" of these different technologies has shifted considerably over the decades. Of course, saying that there is a role for all kinds of collections does not help much with priority-setting.

**Convergence and scale economies.** Part of the answer to such questions depends on what, if any, production scale economies exist for collections of particular types. For example, particular kinds of materials may require specialized human expertise for organizing and tagging. Conventional, paper-based libraries sometimes focus on particular subject areas for similar reasons, to leverage the expertise of the (human) collection managers.

The answer also depends on the existence of any scale economies on the consumption side. For example, search costs might be reduced by providing a smaller number of digital locations in which to hunt for content. Good "educational search engines" and standardized tagging systems might, alternatively, make searching across collections as easy as searching within a particular one. (Indeed, many would argue that if a search utility cannot do this, it is a failure.)

Several participants argued for large collections, on the grounds that expertise in today's particular problem areas – such as tagging and searching, quality assessment and signaling, and digital rights management and intellectual property – require a critical

project mass for solutions.  That points to a smaller number of efforts now – a "convergence" on a limited number of big projects – though once technical and other issues are more settled there could be room for many smaller collections.

xml metadata

Practice

Learn    Objective

Assess

Interoperability with management systems and databases

Source: Macromedia, 2001

**Searching and IP clearance.**  It can be hard to find anything in a large, distributed environment like the Internet.  Emerging standards for metatagging content (e.g., IEEE LOM) should reduce some of the chaos.  Some participants questioned whether the standards are emerging fast enough.  Others worried about whether the front-running standards take adequate account of disciplinary and subject-area differences. Participants were agreed, however, that the considerable work of the library community in this area needs to be reflected in any discussions about repository issues.

Almost every participant commented on the difficulties raised by intellectual property (IP) issues in their own work.  Some mentioned the problem of protecting content creators' intellectual property interests, presumably via some system of digital rights management (DRM).  More raised the need to make it easier to determine the IP restrictions on the content of others – e.g., via digital rights tagging – in order to settle issues of adoption and adaptation for reuse.

Placeholders for rights are being built into specifications for metadata, repositories, and learner information, but learning technology standards organizations have been waiting for applicable standards to emerge from other industries before getting down to specifying a "digital rights expression language" (DREL).  Until these standards emerge, IP issues are likely to continue to be vexing ones.

Will the successful implementation of DREL/DRM and its integration into e-content applications be a force for openness, or facilitate the locking-down of all content and an

end to any sort of "fair use"?  The question was one on the minds of many participants.
Recent trends, such as the restrictiveness of the Digital Millennium Copyright Act
(DMCA), give many of us cause for concern.

**Creating and locating quality.**  The dearth of quality in digital collections makes it all
the more important to develop systems for "reviewing" and reporting on quality.  The
MERLOT project's peer review approach may be one solution.  Rice's Connexions also
envisions quality-assessment mechanisms, involving peer review and "lenses" by which
one can select subsets of reviewers.  But will these be enough?  And what is the role of
"branding" – e.g., by the institutional origin of the content – vs. other quality signals?

It is as difficult to be opposed to quality as it is to oppose efficiency.  Agreeing on quality
is another matter.  A system of peer review seems a natural import from other educational
processes, such as that for vetting the quality of research.  But how does what one create
a culture within which donating time to reviewing is the norm?  (One participant
suggested a "use one, review one" trading system.)

Many Web models exist for quality review as well, but with well-known limitations.
Traveling to on-line auction house Ebay, the software download section of CNET, or the
pages of on-line book retailers Amazon and BN.com provide examples.

One participant noted that the most fundamental test of object quality would be one that
moves beyond subjective ratings to an "outcomes" assessment.  That is, does the content
actually achieve its stated learning objectives?  Such data rarely exists, and would not be
cheap to obtain.  (It would also subject higher education content to a standard now
reserved for K-12.  But the day may be coming.)

**Communities vs. collections.**  Repositories imply a certain "centrality" or one-to-many
orientation.  Many contribute into a central holding area for content – how large and how
central is still an open question.  Many download content from that collection for use in
self-paced learning, as a supplement to a class being taken, or as part of curricular
material for a course they are planning to teach.

Some respondents (and commentators such as Wiley 2001) suggest that the creation of
communities around content will be as important as the content collection itself.  The
communities might be the creators of centrally-held content – modeled on the groups that
create and improve open-source software.  Or the communities might arise to be the
principal source of "content" itself – on the fly, as in the peer-to-peer model of a Slashdot
(albeit one less devoted to "nerds").

Reflecting the sentiment that community is as important as content, one participant
asserted: "The ultimate goal of any common repository of learning objects should be to
build communities that promote the academic culture of sharing knowledge.  For these
communities to flourish, we need compatibility and standards."  But surely we need more
than that to support communities of learning, for collections of content do not self-
generate communities.

The importance of community argues for subject-/community-oriented collections, quite aside from any technical economies or dis-economies of scale. Communities of content producers and users could also be the "place" where we learn more about the particular pedagogical needs of particular settings (e.g., a community for algebra teachers).

As noted earlier, many respondents commented on the problems of finding good tools to produce standardized content. But in this context, the worry is about the social problems of authoring, as much as the technical ones. Perhaps the priority software need is for products that facilitate group collaboration, such as the web-based version-control regimes used by open source collaborators.
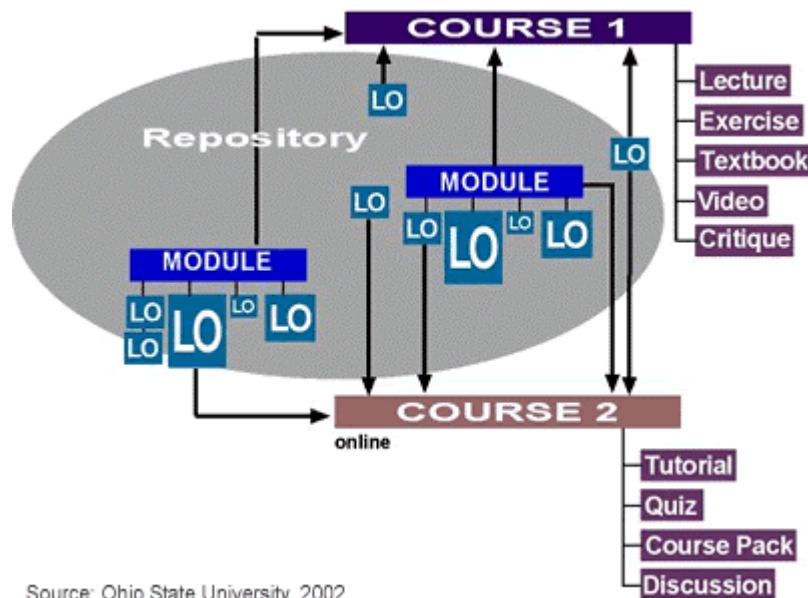


Source: Ohio State University, 2002

**Need to better understand demand.** In the last few years, many a dot-com enterprise has crashed on the failure of a "if we build it they will come" business model. As noted at the outset, participants were united on the need to understand demand better, so that whatever collections are built truly serve the needs of users. Having a great tool for the wrong problem does little good.

It may come as a surprise that demand for educational content is not better understood. Surely this knowledge must reside with commercial content publishers, who have both a long history with educational sub-markets and the economic incentive to understand them? Perhaps it does, and it is simply the kind of proprietary business knowledge that will not be revealed.

But the understanding deficit may also be real, and explained in part by the differing cost structures of paper and digital content. Textbooks, for example, are relatively cheap to develop – aside from a few superstars, most textbook writers receive little or no advance, and earn only on the basis of sales. The big costs come from printing and distribution, and one prints and distributes only enough to meet orders. As one participant with

publishing experience put it: "We can figure out the difference between a success and a failure by which one got to the second or third edition."

Digital content's cost structure is a mirror image of paper:  Development is the expensive part; storage costs, though not free, are small in comparison; and distribution is essentially free, a matter or pushing bits down a wire.  In the digital content world, it is much more important to know up-front what will be consumed by end-users, lest one invest a great deal of resources for a collection that no one really wants.

## CONCLUSION: THE NEED FOR A CHANGED FOCUS

**What we need to know.**  Many of the meeting participants (including the author) were struck by the contrast between high school algebra and calculus – a story offered by a few meeting attendees to illustrate the importance of understanding demand "micro-climates." (Apologies in advance to any algebra teachers who have a different view.)

According to the story, algebra is a basic course, to which little teaching prestige attends; it is required for all, so one must teach a large share of the innumerate.  By contrast, calculus is a prestige topic (relative to algebra, anyway); and it is usually an optional one, that differentially attracts the best students as well as the best teachers.

For all these reasons, algebra teachers tend to want "turnkey" solutions, with the entire range of content mapped out. (It can be the course that the football coach ends up with as a teaching assignment, and he needs all the help he can get.)  Calculus teachers tend to want more freedom to put their own stamp on the course, rather than being forced to follow a cookbook.  Commercial textbooks and other materials for the two subjects subtly reflect these different preference sets.

Of course, as with any generalization of about large numbers of humans, this story will often be wrong in a particular school setting. But any digital content collection that is not mindful of such differences risks immediate obsolescence.  It will be built, but they will not come, as some have already learned: "We produce a lot of e-learning content," one participant noted, "but it never seems to go anywhere."  Perhaps this is why.

Business sustainability is another issue.  Educators generally don't seem to be willing to pay much for digital content.  Perhaps this is because the "product" is not yet the one they really want.  Or perhaps it is the notion that what can be reproduced for essentially zero cost ought to be offered for essentially zero cost.  "Information wants to be free," as the slogan used to go.  But production costs must still be recovered, as the motion picture and recording industries so often note in their crusade against copyright-busting file-sharers.

How can that be done?  "Value is derived differently in different communities," one participant observed, reflecting the group consensus, "and so [content] has to be delivered differently" if you want people to pay for it.  Indeed, the stakes are high, as putting all the pieces of hardware and software together to deliver content is expensive.  "It's a lot of

work" ..."and it costs a lot of money" ... "and it is going to require a payoff" several participants noted. Hence the business problem of understanding demand better than we now do.

Participants' general agreement on this proposition produced the inverted focus by meeting's end. We began with attention to a particular content tool (shareable learning objects), and ended with a focus on the particulars of problems, for which this content tool may (or may not) be a solution. Previous repository developments "have not been preceded by this kind of conversation," one participant noted. "The demand side is [still] not well understood by supply side" and "people have underestimated the training and conversion costs of switching to online materials."

**What we want to do.** Should institutions at every level take a more explicit stand on learning approaches and content choices? We don't have much empirical data on learning outcomes to take a firm stand. Outside of elite institutions, is the norm top-down control of content choices anyway? We are not sure. What case would need to be presented to convince institutions that, at the margin, more or less control was desirable? One that requires more data about the effectiveness of pedagogical approaches than we now have.

Content objects embody a particular design philosophy but also, as noted, a particular epistemological view: that knowledge can productively be chunked into bits, and then reassembled and reused for a variety of applications. Those who believe that content must be contextualized to each application to be truly useful for teaching are skeptical about the productivity of such reuse.

Content objects are usually designed as self-governing entities that interact with learners. Having finished their particular task, they hand off to the next content object, and so on, until the lesson is done. Whether along a static path or dynamically adjusted according to the particular learner's performance, the content objects and the learning management system determine the course of pedagogy.

Though typically web-based, these applications do not tend to give learners the flexibility to explore on their own – a flexibility that is a hallmark of the Web. Why not? One answer is that the instructional designer knows the most efficient route to mastering objectives for a given content set. The CMS-LMS-LCMS manages learning according to that design; the learner does not. It would not be as efficient for the learner to do so. This notion of efficiency is similar to the one that advocates more control of teacher's methods in the name of learning efficiency.

Perhaps it is not a surprise that, in the end, participants split on whether the DIY model of content creation is more common for rational reasons – because what is provided does not really accord with true need – or because of the irrational, cost-ineffective inclination of instructors to believe that we can always do it better ourselves. Since data do not exist to answer such questions definitively, we are left with our prejudices.

How much freedom a learner should have to set his or her own learning course is a mirror of the question of how much freedom an individual teacher should have to set his or her own pedagogical path.  It is another issue that could, perhaps, be settled with better data. It is also a question that is somewhat beyond "facts" to settle, since it requires we set a value on such freedom per se.  Such questions are, to paraphrase one of the participants, "socio-political problems, not technical problems."

All of these uncertainties were encapsulated in one participants observations that we still need to get "to defining the compelling value, the compelling need, but also who is the recipient of failure and would be willing to spend for success."  That is true both at the micro level of curricular design within a given institutional setting, and at the social level of the entire education sector.

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**ORGANIZATIONAL WEB SITES**

Advanced Distributed Learning (ADL)
http://www.adlnet.org/

- SCORM specification and related information

Centre for Education Technology Interoperability Standards (CETIS)
http://www.cetis.ac.uk/

- "clearinghouse" for all kinds of e-learning documents and information

IEEE Learning Technology Standards Committee (LTSC)
http://ltsc.ieee.org/

- learning object metadata (LOM) and other standards; working and study groups on topics such as digital rights:

IMS Global Learning Consortium
http://www.imsproject.org/

- various content specifications, including packaging

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