



macromedia® white paper

Elusive Vision: Challenges Impeding the Learning Object Economy

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Background

In September 2002, 15 leading practitioners and thought leaders in the world of learning object development from the United States, Canada, and Australia gathered in San Francisco for two days of intense dialog and discussions. They represented the diverse sectors of business, higher education, and government, but came together for the common purpose of identifying the systemic challenges inhibiting the realization of a functional economy in learning objects. The overall purpose of the gathering was to begin to explore the components of such an economy, and to start to identify obstacles impeding a reality where learning objects are created and shared, not only within sectors, but across education, government, business — and national borders.

Most of the participants were drawn by the prospect of cross-sector collaboration. Several stressed the need to analyze and diminish barriers between business, government, and academia. Others were enticed by the idea of learning from fellow travelers who perhaps saw the world through a different frame. Some came because they had begun to see that the realization of a functioning economy in learning objects was going to require new forms of collaboration.

There was no question that the group was indeed serious about bringing learning objects into the mainstream. Several of the attendees were legendary advocates of e-learning who had worked for years to bring standards such as SCORM into existence — such leaders as Robert Wisner of the Defense Department's Advanced Distributed Learning Initiative (ADL), Elliot Masie of The MASIE Center, and Michael Parmentier of Booz Allen Hamilton. Influential authors such as Wayne Hodgins of Autodesk and Ellen Wagner of the Learnativity Alliance provided a compelling counterpoint to learning object pioneers such as Jim Spohrer of IBM, who led the creation of the Educational Object Exchange (EOE), the first successful learning object repository. Joining these leaders was Gerry Hanley of California State University and director of the MERLOT project, for several years now the premier repository effort in higher education.

Leading practitioners and training managers, including Gerry Lang from Microsoft and Diana Wilkinson of AT&T Business Learning Services kept a realistic focus to the dialog. Emerging Technology Analyst Judy Brown, of the Academic ADL Co-Lab at the University of Wisconsin, and Patricia Brogan and Frances Himes of Macromedia helped participants see the technological horizon more clearly. Major national efforts in Canada were represented by Tom Carey of the University of Waterloo, a key leader in the Co-Operative Learning Exchange (CLOE) and eduSource Canada projects. Efforts in Australia were represented by Barry Harper of the University of Wollongong, head of the "Use of ICTs in Flexible Delivery" project currently

underway. Their insights and experiences added a critical international perspective to the discussions and an expanded frame for considering funding and policy questions.

With tongue not entirely in cheek, several observed that bringing this group of 15 visionaries around a common table was akin to gathering the zealots to discuss the fate of the unconverted.

Why Learning Objects?

Nonetheless, what better group than 15 confirmed zealots to make a case for why learning objects are worthy of all the time, money, and attention being paid them? Learning objects are very much in tune with the anywhere, anytime promise of technology and the Internet.

The name comes from two arenas of professional practice:

- “Object-oriented” programming, in which bits of code are bundled into reusable bundles that have a discrete functionality and simple properties. Modern programming tasks have been enormously simplified through the use of software objects that can be combined and reused over and over in a myriad of ways without having to rewrite the code they contain.
- “Learning objectives,” which offer simple statements of desired learning and performance outcomes that consider behaviors to be demonstrated as a result of a learning intervention, the conditions under which the learning is to be demonstrated, and the degree of mastery that will be expected from that performance.

Digital “bits” of learning content, packaged appropriately with bits of code to make them easy to find and interoperable in a variety of contexts are posited by proponents as a way to address the need for rapid and flexible learning and to provide that learning anywhere, anytime. New tools for authoring learning objects are foreseen that would make learning design more accessible, more flexible, and more efficient by building good learning design transparently into the authoring environment. A future can easily be imagined in which these well-designed, reusable learning objects are even dynamically assembled by intelligent software agents on the fly, in response to the real-time needs of learners.

Of course, there are those who do not see the expanded use of learning objects in such positive terms. Although there is remarkable agreement on standards for learning object design and implementation, some people caution against viewing the approach as a “best practice” for all learning situations. As Patrick Lambe notes in *“The Autism of Knowledge Management,”*

There is a profound and dangerous autism in the way we describe knowledge management and e-learning. At its root is an obsessive fascination with the idea of knowledge as content, as object, and as manipulable artifact. It is accompanied by an almost psychotic blindness to the human experiences of knowing, learning, communicating, formulating, recognizing, adapting, miscommunicating, forgetting, noticing, ignoring, choosing, liking, disliking, remembering and misremembering.”

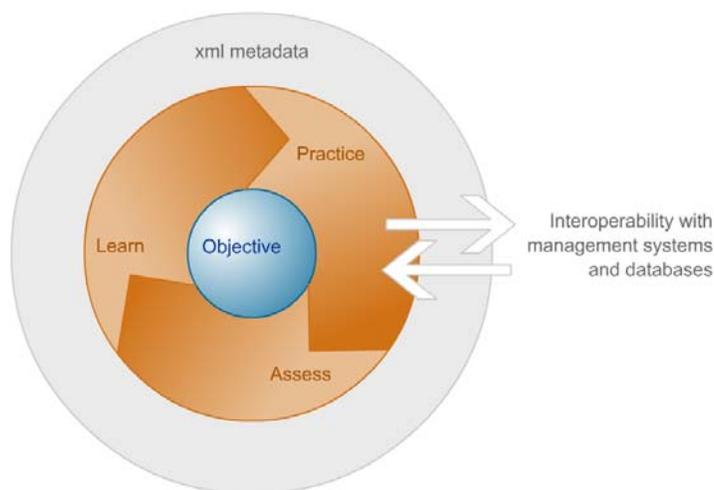
Lambe’s point is that many forms of learning require these very kinds of human experiences. It is a useful word of caution. Although learning objects offer considerable promise for streamlining the development of learning materials, learning is a complex affair, and much work has yet to be done to devise effective ways of building learning tools that encourage collaboration, or discovery learning, for example.

A Brief Learning Object Overview

Confusion continues to exist in practice about what a learning object is, and how it might differ from content files such as a photo, a video clip, or a research report. At what point do typical digital assets like these become learning objects? What distinguishes a learning object from any other sort of learning material?

The most common definition is that a learning object is a collection of digital materials — pictures, documents, simulations — coupled with a clear and measurable learning objective or designed to support a learning process. (The “digital” requirement makes transmission over the Internet or across a network possible.) This view distinguishes a learning object from an “information object” (akin to a simple fact) — which might have an illustration or other materials attached to it — or from “a content object” such as a video or audio clip, picture, animation, or text document. The key distinguishing feature between these kinds of objects and a learning object is the clear connection to a learning process. This definition is built on the clear assumption that by combining learning objects in different ways, higher-level learning goals can be met, and ultimately, entire courses could even be constructed.

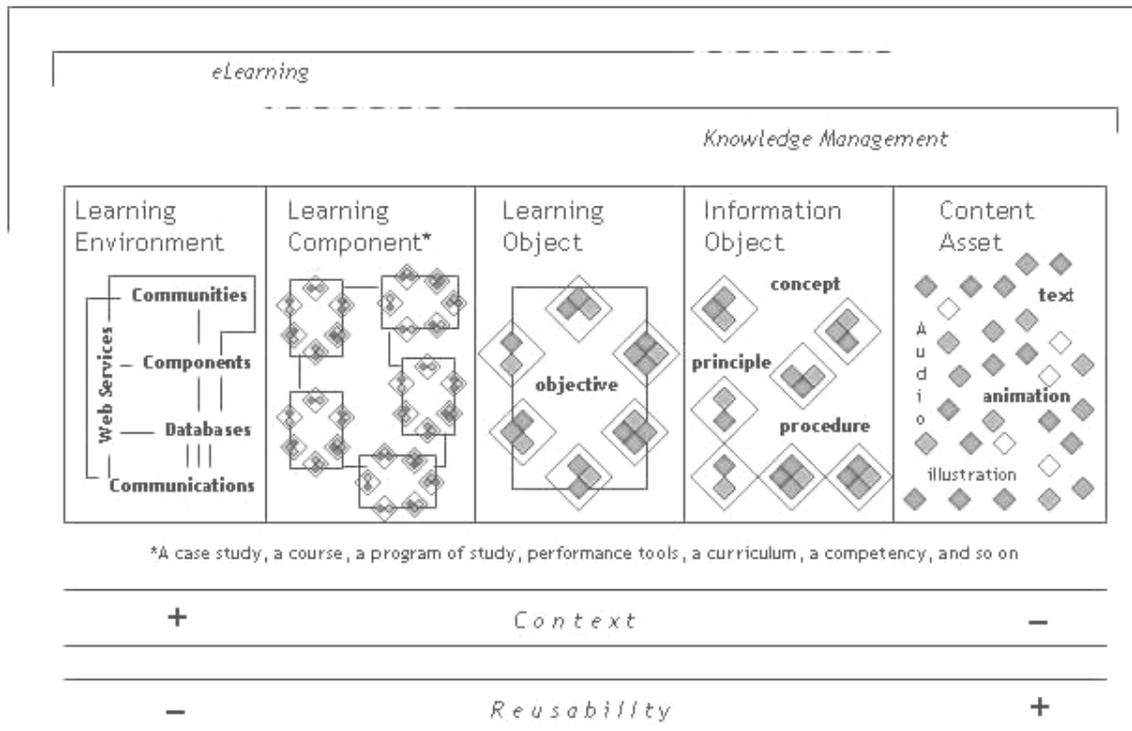
Anatomy of an e-Learning Object



This view has been widely disseminated and is illustrated well by the following model from the Learnativity Alliance. The model illustrates the concept of assembling content into higher-level objects. As learning objects are assembled into higher-order collections such as courses and curricula, the relationship of a learning object to traditional views of what comprises a lesson becomes more apparent. Following the model across from right to left, these components ultimately take their place as part of a comprehensive

learning environment. One salient point often overlooked in the discussion of learning objects is that as more context is added, the intended audience and purpose become more specific, and the objects are, therefore, less reusable outside of that context. For example, a fully formed lesson in Psychology might include a component on passive-aggressive behavior. That same component might also be included in a Human Resources training lesson if it is fairly general, but if too much psychology context is included, it would likely no longer be viewed as appropriate content (and vice versa).

C o n t e n t



Source: Learnativity Alliance

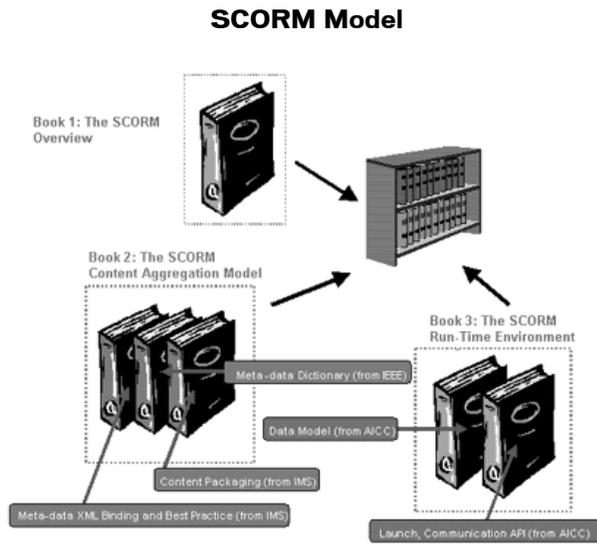
This point is illustrated in the Learnativity Alliance model by the inverse relationship between context and reusability. Another key implication of the aggregation process is that the management of digital rights becomes more complex as content and context are combined. Although the rights associated with a photo or illustration might be fairly easy to manage, the complexity of the rights management of learning objects (and learning components) increases as more content and context is added. At higher levels, the rights associated with a learning object or learning component include not only the rights connected with the content objects but also the authorship rights of the assemblers and aggregators of those components.

Documenting and managing these rights is one reason that, as learning objects are aggregated from lower-level assets and more context and features are added, the task of describing the object becomes more complex. If the object includes interactive or assessment features intended to interoperate

with a learning management system (LMS), additional run-time information is needed to ensure communication with the LMS. A variety of solutions have been developed to enable these higher-level attributes, generally using XML metatags to add descriptive and additional rights information and companion run-time files to communicate with the LMS. Macromedia illustrates these higher-level learning objects as a sort of onion, with successive layers adding meaning, context, and functionality to the learning objective.

Several agencies have been working on standards for LMS interoperability, including the Institute of Electrical and Electronics Engineers (IEEE), the IMS Global Learning Consortium (IMS), the Aviation Industry CBT Committee (AICC), and others. Remarkably, there is almost no disagreement on these standards. The Defense Department's Advanced Distributed Learning initiative (ADL) has led the effort to apply this work to learning objects.

The Sharable Content Object Reference Model (SCORM) draws from all these efforts, using IMS specifications for content packaging and metadata, launch communication APIs and the overall data model from the AICC, and the metadata dictionary from the IEEE.



Source: Advanced Distributed Learning Initiative

The Learning Object Economy

Clearly much has been accomplished in building out the theoretical infrastructure to support learning objects. Although a learning object approach might not be the answer for every learning situation, successful demonstration projects such as MERLOT (the Multimedia Educational Repository for Learning and Online Teaching), CLOE (the Co-Operative

Learning Object Exchange), and the EOE (the Educational Object Exchange) have shown they can be useful in a large number of contexts. These successes have fueled commercial and proprietary interests and efforts. Cisco, Microsoft, AT&T Business Learning Services, and many other companies have used a reusable object approach to structure internal training and customer certification programs with some considerable success.

Even given these successes, however, no one at the table during the San Francisco forum would have described the current level of activity as pervasive. Discussions over the two days focused rather on how to make the effort reach a “tipping point.” As Elliot Masie put it, “The issues with the learning object economy are content, content, and content. Unless we create an economy of content in which individuals and organizations can acquire, adapt, and repurpose content, the industry won’t be successful.”

Every economy is based on markets, and a vibrant learning object economy would likely have at least five, each operating under a different exchange approach. The first type, proprietary exchanges, is created for the exclusive use of an individual company or industry. A common example would be repositories of digital assets purchased or created for the use of employees or authorized agents. These are most often located behind firewalls on corporate intranets.

Commercial exchanges are the heart and soul of any market economy, and in the commercial market for learning objects, end users and aggregators purchase content under specific licenses that allow them to use the objects in clearly defined ways. This arena includes large traditional publishers who want to repurpose their content as learning objects and training companies eager to move into e-learning. Also appearing are a crop of smaller new entrants who publish learning objects as their core business. This market has some special challenges, and many issues related to licensing remain to be sorted out. As Jim Spohrer, founder of the EOE notes, “The problem of establishing a learning object economy is that there is a disconnect between aggregators of content and users of content — aggregators who want to protect the integrity of their work versus those who want to deconstruct an object and put it together with others.”

Free exchanges for learning objects have emerged primarily from the academic world and have proven very hard to sustain without ongoing subsidies. Two notable examples, however — MERLOT and the EOE — continue to grow after many years of existence. One ongoing criticism of free learning-object exchanges is that the quality of the objects is often uneven. MERLOT has worked hard to reverse that perception by developing a highly regarded system of ratings and peer review.

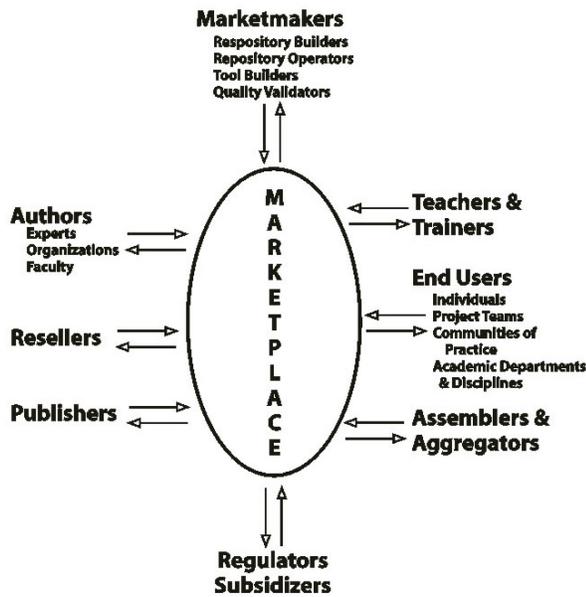
Shared exchanges have begun to emerge as another response to the demand for high quality. Shared exchanges require their objects to meet certain criteria, such as interoperability or SCORM compliance, and builders of such exchanges often develop learning objects themselves or purchase them

under contract to ensure their standards are met. Shared repositories can be found in numerous countries around the globe. Notable among them are the new Alexandria repository from eduSource in Canada and the Le@rning Federation project in Australia. Because the funding for these projects comes from their federal governments, it is likely that the materials developed under them will be open only to specific groups within those countries.

On the horizon are peer-to-peer exchanges using networks such as Kazaa or other post-Napster variations, especially if learning objects begin to be seen as more valuable in their own right and commercial exchanges begin to take off. Such networks could well serve as gray or even black markets for learning objects in the future.

The requirements for a well-honed learning-object economy can be derived from a study of other economies. As previously noted, it is likely a fully functioning learning-object economy would include all of the market/exchange types previously described. Authors need to be able to make a living by contributing content. Publishers and resellers will want to package that content for sale to various users and communities. End users — individuals, project teams, communities of practice, academic departments, and disciplines — are the presumed recipients of this content, along with teachers and other assemblers and aggregators of content. A fully functioning, vibrant market, illustrated in this simple model, would have to include tool builders and repository operators as well as mechanisms for ensuring or certifying quality.

The Learning-Object Economy



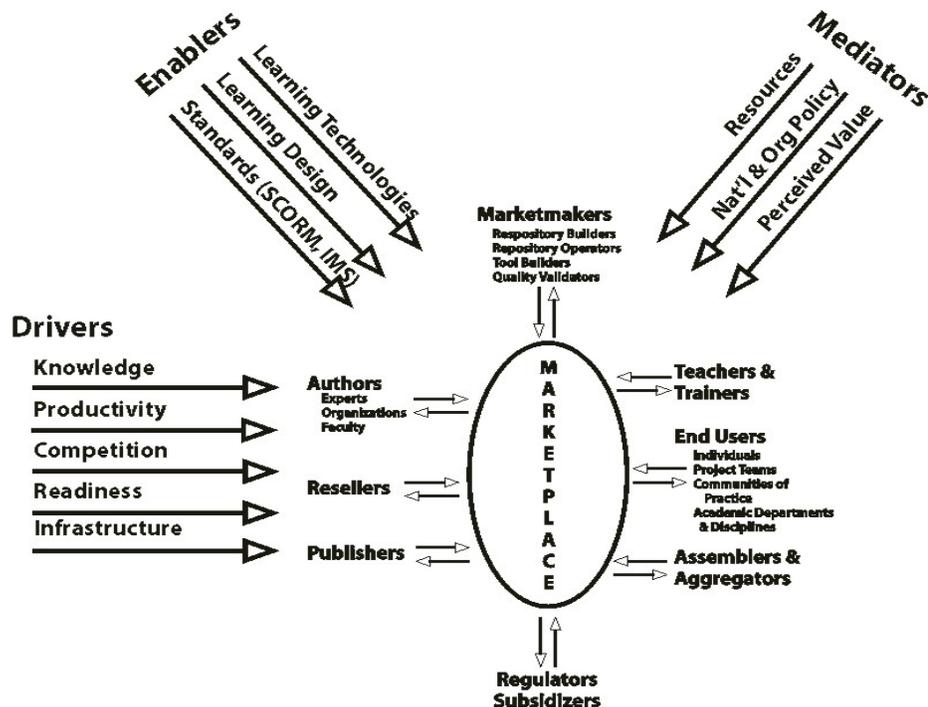
Source: The New Media Consortium
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Drivers, Enablers, and Mediators of the Learning Object Economy

Economies do not exist in a vacuum; they are part of a larger system. The central focus of the San Francisco meeting, and the reason that particular group of people had gathered, was to consider what systemic forces were influencing or hampering the development of a learning-object economy. The participants spent two days discussing potential drivers and mitigating factors, which were labeled as either enablers or mediators, with an eye to identifying key obstacles or challenges that remain to be solved if the vision is to be achieved. The result of that work forms the remainder of this document.

In the model developed from the discussions, “Drivers” were seen as pressures spurring development of the learning-object economy. “Enablers,” on the other hand, were supporting components of the learning-object economy that, to the extent they were present, could facilitate the development of learning objects and repositories. “Mediators” were a more slippery sort of influence. They were seen as components of a learning-object economy that, depending on how they were present, could either hinder or facilitate the development of learning objects and repositories. For example, many participants felt that the lack of clear policy related to digital rights is hampering the development of a commercial market in learning objects — whereas the appropriate clarifications to digital rights policy could be a stimulus.

The participants were in remarkable agreement about the items listed in each of these categories, and although they acknowledged that others could be listed as well, these seemed a useful framework for the discussion of systemic challenges. Under each of the Enablers and Mediators, key questions were framed that led to the articulation of the challenges detailed in the remainder of this document. As the challenges emerged from the discussions, it was natural that some discussion took place about potential solutions and what might be required. Addressing the challenges identified here might not be sufficient to reach the “tipping point,” but the group agreed that without significant attention to these areas, realizing the vision of a fully functioning learning object economy might continue to prove elusive.



Drivers

Knowledge. The expanding body of knowledge is creating an immediate and recurring need for learning across organizations, sectors, and nations.

Productivity. A demand for ever-increasing productivity requires people and organizations to work smarter.

Competition. Intra-sector, national, and international competition for markets, for resources, or simply for “an edge” creates a rationale for rapid learning solutions.

Readiness. A need to be prepared for unanticipated situations increases reliance on “just-in-time” learning.

Infrastructure. A rapidly evolving information infrastructure provides a mechanism for quick access to a large amount of material.

Enablers

Learning Technologies. Tools and techniques that support the development, deployment, access, and use of learning objects.

Learning Design. Theories and techniques of teaching and learning that, when applied appropriately, ensure successful learning outcomes.

Standards. Common specifications and guidelines that can ensure learning objects are reusable, accessible, interoperable, durable, portable, and affordable.

Mediators

Resources. Money, talent, material, and other needed resources made available for the construction of learning objects and repositories.

Policies. National or institutional policies, rules, and practices that can either encourage or inhibit the development, management, and distribution of learning objects and repositories.

Perceived Value. The return people and organizations see as accruing from the investment of time, energy, and money in developing learning objects.

The Enablers: Challenges and Opportunities

Learning Technologies

What gaps currently exist in the learning technologies available to authors?

- Tools that make good learning design a transparent process and facilitate the assembly of learning objects into larger units based on sound instructional design principles
- Tools that facilitate the authoring of standards-based learning objects by seamlessly packaging the object with any required companion files and metadata needed to ensure reusability and interoperability
- Tools to retrofit existing learning materials with reusability and interoperability components and metadata

What gaps currently exist in the learning technologies available to those who build, manage, and make use of learning-object repositories?

- An XML-based repository framework “in a box”
- Tools to capture, document, and manage digital rights
- Tools to facilitate and manage the process of adding new information objects to learning objects or aggregations of learning objects without violating the rights of the original creator(s)
- Transparently easy-to-use end-user interfaces
- Tools to rate and review objects
- Tools to effectively search across several repositories at once

Learning Design

Are new models of learning design needed, or is the existing body of knowledge in these areas sufficient?

- The existing body of knowledge is sufficient but not widely understood.
- Good learning-design models need to be made more accessible to people charged with the authoring of learning objects and higher-level components.

What are the barriers to the broad-scale use of good learning-design practices in the development, management, deployment, and evaluation of learning objects?

- Tools need to be developed that make the use of these practices automatic and transparent to authors and other aggregators of content.
- Quality standards need to be articulated so learning objects can be certified as meeting minimum criteria for effectiveness.

Standards

What needs to be done to increase the demand of users and user groups for learning-object-based solutions?

- Practical information about the object-based approach and its benefits for users must be developed and made available.
- Clear information about the potential types of learning objects and how each would work from a user's perspective must be developed and made available.
- The broad adoption of standards by learning management, knowledge base, and content management system providers must be encouraged by articulating a strong business case for such enhancements.

What needs to be done to spur the incorporation of standards-based interoperability into learning management, knowledge base, and content management systems?

- The value of interoperability needs to be clearly endorsed by large user communities, for example, industry associations, the defense department, K-12, and higher education.
- Clear business cases for adding these new features must be articulated.
- Large-scale standards-conformant repositories that such systems could potentially access must be in visible development.

The Mediators: Challenges and Opportunities

Resources

In the absence of relevant policy, how can government and industry funding serve as an inadvertent barrier to the adoption of standards?

- Well-funded authoring initiatives often limit access to the created objects as a precondition of funding and thus reduce one of the key incentives to adopt standards.
- Similarly, industry-funded initiatives often result in proprietary systems that have little need for interoperability.

What gaps exist in current policy that, if addressed, could stimulate the application of funds and resources to the development of a robust learning-object economy?

- National- and international policy initiatives are needed to solve the digital rights and intellectual property challenges inhibiting the development of commercial exchanges.
- Policy initiatives directed at skills shortages and training needs that encourage the development of learning objects to meet specific needs

would encourage government and industry to subsidize such development.

- Public funds targeted for development of instructional materials should be subject to requirements that ensure reusability and the development of generalized object frameworks.
- Clear agreement within key large-scale user communities on standards for interoperability (e.g., industry associations, the defense department, K-12, and higher education) would encourage industry to develop applications that incorporate interoperability.

Policy

How do national or organizational policies serve as barriers to the development of a learning-object economy?

- Well-funded authoring initiatives generally must limit access to the created objects as a precondition of funding, thus either excluding learning objects from the marketplace or placing boundaries on parts of the marketplace that might use the materials.
- Policies on intellectual property and digital rights vary widely from country to country, inhibiting development for open markets by authors and publishers wishing to preserve their ownership rights.

What gaps exist in national or organizational policy that must be addressed to stimulate the development of a robust learning-object economy?

- Digital rights management, specifically national and organizational policies to address issues in the distribution and reuse of learning objects, especially as it pertains to the potential deconstruction and repurposing of objects
- Public policy to stimulate authoring in the areas of skills shortages and workforce training

Perceived Value

What are the obstacles to articulating the value proposition for learning-object approaches to potential adopters, authors, and users?

- Difficulty in understanding the component-based approach to learning embedded in learning-object theory
- Difficulty in seeing how learning-object-based approaches can be more efficient or more effective
- Lack of common language even to discuss these points

How can policy- and decision-makers be helped to see the value of learning-object-based approaches to learning?

- Clear data is needed on the costs, monetary and otherwise, of adopting a learning-object-based strategy, the relevant benefits, and the opportunity costs of not doing so.
- Information is needed that details the practical mission-focused reasons for supporting learning-object-based approaches.
- Effective business models need to be identified and described in clear-cut, practical terms.

Concluding Thoughts

The 15 visionaries that gathered in San Francisco were described at the beginning of this paper as thought leaders, all passionate about and deeply committed to realizing the promise of learning objects. It would have been easy for such a group to rush from the discussion of challenges to the prescription of solutions, but this group did not. From the beginning of the discussions, they were very clear that the value that would come from this particular gathering — and the thoughts and ideas that would emerge from it — would not be prescriptions but rather the impetus for a continuing conversation among business, education, and government leaders about how to realize the vision of an economy of learning objects. The discussion started here would have to be expanded and others invited to participate in devising solutions to these challenges and more that might be identified along the way.

The participants agreed that the very best outcome of the San Francisco forum would be a “starburst” of continuing dialogs — other forums in other settings asking similar questions and looking for answers. As one participant noted at the end of the meeting, “What happened here was extraordinary not only for what happened here but also simply because is not ordinary to do such things. We interact almost exclusively on our own playing fields. It should not be such a remarkable thing for business, government, and education to work together.”

Among the many ideas discussed as next steps was a proposal to convene a follow-up meeting to pick up on the work done here and begin to craft solutions — a larger gathering, with more international participation — a Global Learning Object Summit. The potential for such a meeting was weighed and considered from a number of perspectives.

In the end, the group concluded that it is not yet time to move to solutions. What is needed next is consensus on the challenges. The best next step would be to distribute the ideas captured here broadly and to encourage responses and further dialog. If these are indeed the systemic challenges that need addressing, a consensus will emerge and then it will be time to discuss solutions.

In that spirit, this paper and the thoughts contained within it are offered in the hopes that they might serve as a useful starting place — and perhaps a catalyst for that starburst of continuing dialog.

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