

The Dark Side of Object Learning: Learning Objects

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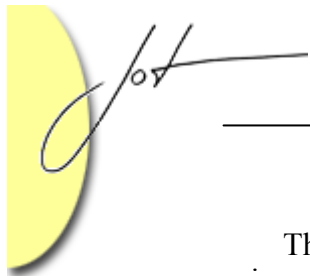
1 LEARNING OBJECTS?

The “holy grail” of (object) learning has been to facilitate just-in-time learning of skills that is delivered in a manner that works best for the learner. That is, the right skills at the right time in the right way. To facilitate this “holy grail”, developers of learning would be able to develop content that could be customized, reused and transformed for delivery in different formats easily, efficiently and effectively. Learning objects provide the foundation for supporting this capability, and have the following characteristics:

- Small, self-contained modules of learning that tackle a single concept, information, procedure, or fact that can be delivered independently (this implies that the learning object defines learning objectives, “tests” for pre-requisite knowledge/skills, has materials to deliver the needed learning/skill, and assessments to ensure skills have been acquired.)
- The learning object has “metadata” that allows it to be indexed and searched.
- Learning objects can be combined with other learning objects easily and effectively, e.g. to form a course.
- The learning object can be transformed easily for delivery on different media, including traditional classrooms, computer based training, and the many forms of online or e-learning.
- The learning object facilitates OO principles to be applied to learning, including facilitating reuse and ease of change.

The state of the art of learning objects shows that it is, at best, at its infancy, and needs substantial work to make it effective. The following paragraphs highlight some aspects of the state of the art.

There are as many terms and definitions of learning objects as there are organizations claiming that they are using it – see <http://www.reusability.org/read/#1> for a summary.



The strongest work has been in establishing “standards” for learning objects, primarily aimed at metadata and e-learning, including the popular SCORM (Shareable Content Object Reference Model) from the government sponsored Advanced Distributed Learning organization (see <http://www.adlnet.org/index.cfm?fuseaction=scormabt>), and LOM (Learning Object Metadata) which is being developed by a Working Group of the IEEE Learning Technology Standards Committee (see <http://ltsc.ieee.org/wg12/>.) See <http://www.linezine.com/2.1/features/whheyewtkls.htm> for a summary of learning object standards.

Even though there exists many repositories of learning, some of them freely available (e.g. MERLOT (<http://www.merlot.org/Home.po>), ESCOT (<http://www.escot.org/>), GEM (<http://www.geminfo.org/>), etc.), these repositories provide access to complete courses, and any learning objects and the capabilities of reusing them is constrained to “internal” use within the organization that developed it. Usually, learning objects are reusable only within the delivery media that they were created for, and within the constraints of the course and proprietary tools.

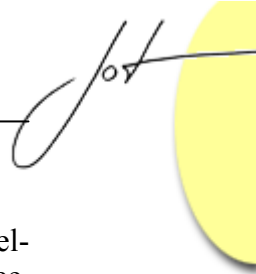
So, why is it that learning object technology is so far from reaching its potential? Well, the answer lies in the complexity of the problem it is trying to solve, the need for more advanced architecture and design of learning objects to address this complexity, and the tools, infrastructure and skills that are needed to address the problem effectively.

To understand the complexity, consider the IBM 4-Tier Learning Model™ shown in figure 1 below, which shows the many approaches currently available for learning organized into layers based on learner experience. Each layer further shows the different formats that could be used to facilitate that experience.



Figure 1: IBM 4-Tier Learning Model

Now consider addressing the skills needs of a typical application developer in building object-oriented, distributed, component-based, e-business applications. This need would translate into courses on technologies (OO, Java, XML, HTML, etc.), products (e.g. IBM



WebSphere Studio Application Developer), design (OO analysis and design, Model-View-Controller, structs, layered architectures, etc.), and solutions (e-commerce, application integration, supply chain management, etc.) Imagine the cost of having all these courses available in all the four tiers and the complexity of making an overarching change when adding web services across all courses.

The following section addresses this complexity issue by discussing the top myths surrounding learning objects, and through these myths uncovers the underlying complexity of the problem being solved. The final section looks at the total approach needed to address learning objects.

2 MYTHS OF LEARNING OBJECTS

This section uncovers the complexity behind learning objects by looking at some of the myths surrounding them.

Build Once, Deliver Anywhere: This myth is the cornerstone of the promise of learning objects – that each learning object will be built once, and then transformed into components that can be delivered in any format (satellite, CBT, online learning, digital video, virtual classes, and classroom formats.) This myth is made more seductive by the promise of being able to do these transformations automatically and cost effectively. In practice, the ability to transform learning objects into different formats and still keep the effectiveness of the learning requires very careful design and planning, is very difficult to do, needs a lot of hand crafting, and needs good support in tools and infrastructure. Such transformations are very expensive and time consuming. The current focus in this area is to look at delivery formats that are compatible (e.g. classroom and e-classes) and define tools/processes/infrastructure that can facilitate efficiencies in building for two formats rather than just one. So, its more like “design once, optimize building and delivering in two formats.”

I Did It My Way: Expecting learners to be sophisticated enough to determine “on-the-fly” the “right” way of learning among a set of choices with subtle differences is another myth. Imagine being able to articulate the differences in the learning experience between listening to a web lecture online, taking a multi-media CBT, experiencing digital video, using an online self-paced e-learning module, participating in a virtual e-class, and going to a classroom. How does a learner decide which one is best for the particular skill that they are trying to acquire. Furthermore, can learners who have spent most of their learning life in one format (classrooms) really learn effectively in other formats? In practice, most people want to follow a “prescribed” way of learning, and this often translates to “blended” offerings where courses are presented in the format according to the skill being acquired, e.g. introductory skills are available as self-paced e-learning, while the more complex “do” skills are available as (e-)classroom experiences.

If we build it, they will come: From the experience in training to date, especially in IT skills, there is no evidence to support the myth that a range of learning choices attracts

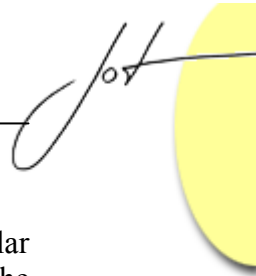
more learners than just supporting a single (or few) choices. So, here is the “catch-22” of learning: To be able to provide real learning choices requires a massive investment in building entire curricula that are flexible and available in different formats, skills to deliver the courses effectively, and supporting infrastructures to facilitate an effective learning experience for each student. Such an infrastructure would generate a lot of demand. However, to facilitate such a massive investment would require us to show that there is a “pent-up” demand that is NOT being addressed by current learning experiences. Note, the recent plea for a national initiative for IT in education supports the need to break this “catch-22” (<http://www.ibm.com/news/us/2002/09/272.html>.)

Size Matters: A good indicator of our inexperience with learning objects is the myth that a good way of chunking a learning object is by time. So, learning objects are about 15 minute chunks of learning, that can be combined to handle concepts that can be delivered in 30 minutes to 1 hour chunks, which in turn can be combined to deliver skills in 2-4 hour modules, which in turn can be combined into courses that can be delivered in 8 hour days. This problem is further exacerbated by tightly coupling a development concept (learning objects) directly with delivery concepts (classes, modules, units.) In reality, this chunking is arbitrary, and negates the need for designing flexible learning objects to address a wide range of learning needs and experiences. As we have learnt with reuse and component technologies, the size of the component is NOT the issue, the issue is designing the right components that are independent, have well defined interfaces, can minimize the impact (and cost) of change, and understand how to work effectively with other components to achieve the desired effect. Another problem area that has not been addressed adequately is how to handle labs or exercises that form a significant component of learning skills. To date, most of the work on learning objects has been targeted towards content, and therefore we tend to treat labs in a monolithic manner (rather than as learning objects.) What we need to propel learning objects into the next level of maturity are comprehensive architectures that handle all aspects of learning (e.g., visit <http://www.lsal.cmu.edu/lsal/expertise/technologies/learningservices/vuarchitecture.html> for details on the work being done at the Learning Systems Architecture Lab.)

3 DEVELOPING A MODULAR LEARNING OBJECT APPROACH

So, how does one build a modular learning object approach? The following areas must be addressed in developing a modular learning object infrastructure.

Instructional Design of Modules: One of the most important aspects of building a modular learning object curriculum infrastructure is the design of the modules/learning objects. This new instructional design approach needs to address how to design a single source that can be used across courses with differing audiences or objectives and delivered in different media. Also, the instructional design approach needs to outline how to handle requirements for such modules, what is the best way to approach developing the module, and how the instructional design supports the integration of the module into several courses as well as delivery in different media.



Templates, Cookbooks, and Guides: Another important aspect of building modular learning objects is to ensure consistency in the individual modules and uniformity in the way these modules are used. In particular, the following are needed:

- Templates for the learning object which identifies the components for defining a learning object (for example, title, prerequisites, objectives, description, etc.), the type of information that must be provided for each learning object (for example, content material, script for presenting the content, instructor guide, etc.), and the templates for describing the required information (for example, smart masters, color schemes, format/font/structure, etc.)
- Cookbooks for transforming the learning object into a module suitable for delivery in a particular medium. There should be a cookbook for each delivery format, and the cookbook will define how to take the single source learning object and transform it into an object that is suitable for the medium.
- Guides for packaging of modules into a course (classroom or e-learning) offerings. These guides will describe how to package a set of modules along with the appropriate schedules, agenda, exercises, case studies, flow, printing profile, etc. into a course offering.

A Modular Learning Infrastructure: The final piece of the puzzle are the tools and products that are needed to support the learning infrastructure. In particular, we need to address the following:

- Repositories: How to build, use, maintain and manipulate the module, course, and curriculum repositories and their interactions with other systems and resources.
- Development Tools: What tools will be used to build the base learning object, to support the definition and use of the templates/cookbooks/guides, to transform the learning objects to the appropriate medium, to package the learning objects into a course, and to deliver the course.
- Organizational Tools: What tools and products will be used to handle processes and to facilitate resources to interact with the learning infrastructure. These organizational tools must be able to support efficient searching, control access for different users, facilitate workflow to track offerings through the entire lifecycle (requirements to delivery), interface with external systems, allow discussions among selected user groups, and provide appropriate communication channels.

Figure 2 summarizes the infrastructure needed to support learning objects.

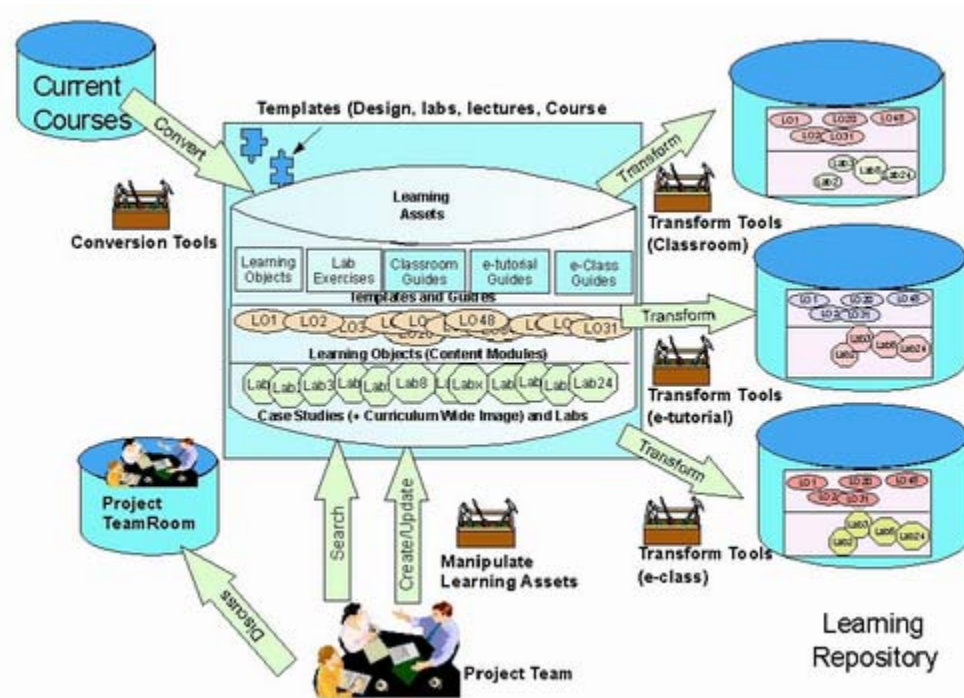


Figure 2: Modular Learning Infrastructure

In summary, learning objects are still at their infancy, akin to first few years of OO where we were arguing against “code-reuse”, understanding that reuse was very difficult, having “methodology wars”, and getting very excited about any established “standards.” We still need to go through the growing pains of investing in component technologies, reference architectures, infrastructure, appropriate development, testing, and deployment tools, as well as the establishment of standards and best practices. It will be an exciting and rewarding journey. Welcome to the dark side!

About the author



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