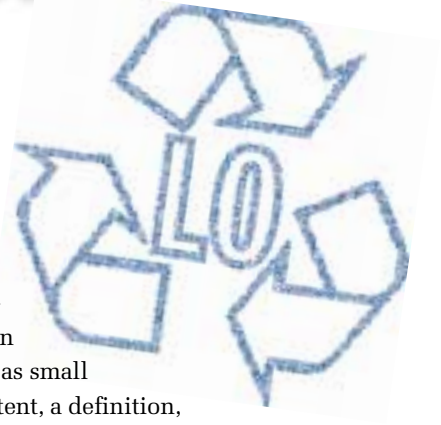
Learning Objects & ISD

by Chuck Barritt



Creating a database of reusable learning objects (LOs) is the goal of many organizations and standards groups. When designed and implemented correctly, LOs have many benefits for both authors and performers. It is possible that a single LO can support many solutions, such as e-learning, classroom instruction, virtual seminars, and performance support tools. Performers can search for LOs that meet their needs, have LOs prescribed to them, or bookmark LOs for future use. Authors can leverage existing LOs to speed the creation of new performance solutions. Achieving these benefits, however, has some challenges. The primary challenge covered in this article is how the instructional system design (ISD) may be modified to allow for the implementation of LOs.

In *The Conditions of Learning* (1996), Gagne and Medsker present a generic ISD process that is now largely accepted by human performance technologists. I have modified this process to account for the implementation of learning objects. Figure 1 compares the LO process with a generic (traditional) ISD process. Your process may differ depending on your content, authoring tools, delivery, and evaluation needs.

What Are Learning Objects?

There are many ways to define the size and function of an LO. An LO can be as large as a course or as small as a specific piece of content, a definition, for example. In fact, the size and shape of an *object* is open to your organization to define, as there is no industry standard at this time.

Most would agree, however, that an LO is based on a single learning or performance objective that is presented through content, practice, and assessment items. Content, practice items, and assessment items are built out of text and media elements and may have interactivity. These elements, or building blocks, of the LO may function like any other object in that they are available for reuse by the authors and can be delivered to the performers.

Just as elements are combined to form an LO, LOs in turn can be combined to form a hierarchy. For example. the LO may be placed into a lesson, module, unit, course, and then curriculum. It is also possible the LOs are used in a performance support system, job aid, help system, or exploratory learning environment.

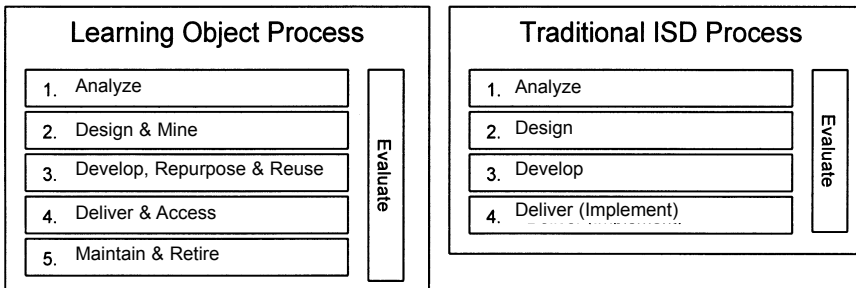


Figure 1. Comparing the Processes.

Cisco's Learning Objects

The Internet Learning Solutions Group (ILSG) at Cisco Systems, Inc. has created the following hierarchy for its LOs: Course, Module, Lessons, and Topics. ILSG defines lessons as reusable LOs (RLOs) and topics as reusable information objects (RIOs). These RIOs are built out of a single learning objective containing content, practice, and assessment items (see Figure 2).

To build a lesson or RLO, five to nine RIOs are combined with an overview and summary. To aid in content standardization, ILSG has chosen to further classify each RIO as a concept, fact, procedure, process, or principle. Each of these RIOtypes uses an instructional template for content, practices, and assessments. (Details on the RLO Strategy can be found at www.cisco.com/warp/public/10/wwtraining/elearning/implement/guides.html.)

Note that this article simplifies ISLG's terminology by using the term learning objects for both RIOs and RLOs.

Evaluation: Applied at All Stages

In both the traditional and the LO process, evaluation can be applied at every stage. Evaluation data are important to the developer, author, content owner, and business. They can be used as summative and formative feedback about the impact of the performance solution.

Kirkpatrick's (1996) evaluating training programs defined four levels of evaluation: learner satisfaction, meeting the learning objectives, transfer of learning, and business impact. These four levels offer a useful framework when discussing what has changed and remained the same between the traditional and LO processes.

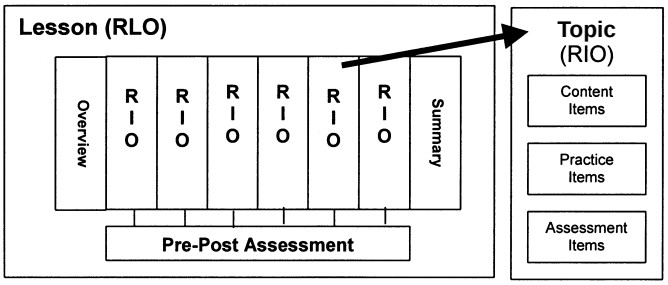


Figure 2. Cisco's RLO and RIO Structure.

What's the Same

Your organization's goals in conducting evaluations will remain the same in both processes. The challenges you face today with creating valid and effective evaluations at all four levels will still exist in the LO process.

What's Changed

The following are three areas that may change when you conduct LO-based evaluations:

1. **When to Conduct Level 1 Evaluations:** Most traditional courses will end with the performer completing a Level 1 evaluation to measure satisfaction with the learning experience. If the learning experience is built out of LOs, or is part of a performance support system, it is possible that there isn't a formal completion to trigger the Level 1 evaluation. Even if the learner takes a collection of learning objects called a course, there is no guarantee that he or she will complete every object in the course or proceed in a predetermined order.

   When to issue the evaluation is a challenge as the learner may access 10 small objects within a 15-minute period. Do each of these objects end with an evaluation or does the entire 15-minute period? It could get annoying to have a new evaluation for every LO accessed by the performer. Deciding when and where to conduct Level 1 evaluations is up to your business to define.
2. **New Sources of Data:** Having a database of LOs that are dynamically accessed by the performer opens many possibilities to tracking usage trends, media selection, and profile information. You could run reports giving the number of times an LO has been accessed, who accessed the LO, the job function of the accessor, and other background data.
3. **Direct Performer Feedback:** It is possible that LO delivery systems will allow the performer to give feedback on each LO through a comments field. Comments are saved so they can be accessed by other performers looking for best practices, or by the developer who is updating the LO.

Stage 1. Analyze

This stage explores all the factors that affect the performance gap of the target audience, identifying the desired performance, and using that information to select the best intervention. (More information on analysis can be found from Allison Rossett's *First Things Fast: A Handbook for Performance Analysis* [Jossey-Bass, 1999].)

What's the Same

The following should remain the same for both the traditional and LO processes:

- Having enough time to conduct an analysis of the performance gap
- Gaining organizational support for the solution
- Identifying other solutions to solve the performance gap (it may not be a training solution)
- Defining job tasks, competencies, skill maps, and performance objectives
- Documenting the facts, concepts, principles, procedures, and processes that are part of ideal performance (based on existing procedures, direct observation, interviews, etc).

If every author repurposed a small percentage of the LO "What Is a Pencil?" the database would be littered with multiple LOs that are so similar that authors and performer may find it difficult to distinguish between them.

What's Changed

While other areas may change in your process, these three are a starting place:

- **Account for LOs Early in the Process:** Even before you have selected the performance solution, you can start thinking in terms of learning objects. They may influence the types of questions you ask, how you research tasks, and the context for the solution. The specific changes depend on how your current process is affected by the LO process.
- **New Access Method as a Solution:** The analysis could indicate a solution that is simply another method of accessing an existing LO. It is possible, for example, that an existing training course contains an LO that can be used as part of a performance support tool. This reuse is made easier if the course is built and stored as LOs in a database.
- **More Data for Analysis:** It may be possible to collect data and reports from the LO delivery environment. A report, for example, could compare job performance with the access to LOs. This could indicate that the LO is incorrect, or that the access method was hindering transfer of knowledge and skills to the job.

Stage 2: Design and Mine

This stage adds the idea of mining for LOs to the traditional design stage. An important function of a database of LOs is the ability to find out what already has been created, gather evaluation data and usage statistics, or add media elements to existing objects.

What's the Same

Three areas that should be familiar to your current process at this stage include the following:

- Define the practices and assessments needed to solve the performance gap (to match the performance objectives).
- Determine the instructional strategies and media options, language needs, and accessibility issues.
- Sign off on the design of your solution through a design plan.

What's Changed

The changes in your design will depend on the system you use to implement learning objects. You can imagine that there would be more changes when using a system that is feature rich, links LOs to job competencies, and enables multiple delivery options or prescriptive learning.

- **Mining for Learning Objects:** The speed in which you find existing LOs should increase once the tools and systems are in place to support the storage and retrieval of learning objects. The key to success at this stage is having valid metadata to search against (metadata includes information about the object such as key words, owner, objectives, and so on). It is recommended that the creation and update of metadata be built into the entire LO process.
- **Multiple Delivery Options:** It may help sell your solution if the stakeholders understand that a single LO could be used to support multiple delivery types.
- **Longevity of the LO:** LOs that are leveraged in multiple performance solutions or delivery venues may live beyond those in a traditional one-time event, such as a course. Once created, an object can be reused by other authors or performers who may bookmark the LO for future use. Again, any solution you create today may live beyond what you had originally intended. This can be a valuable feature when justifying high-budget items such as simulations.
- **Designing for Reuse or Repurposing:** During the design phase you can identify LOs that exactly match your needs without modification, or those that can be repurposed (modified in someway). Ideally, you would document and promote the percentage of reuse and repurposing, along with any associated cost savings.

Stage 3. Develop, Repurpose, and Reuse

At this stage, you may use the services of a large team of specialists or rely on a single person. The primary change to this stage is the ability to reuse and repurpose LOs. To fully support this stage, you will need to establish reuse guidelines and LO-based tools.

What's the Same

Three items will remain the same at this stage for both the traditional and LO process:

- Validate new and existing content to be included in your solution.
- Create content, practices, and assessment.
- Review, alpha and beta test, and copy edit of LO.

What's Changed

What changes most at this stage depends on the tools you have in place for developing LOs. With that in mind, here are six areas where you may notice the most change:

- **Research:** Ideally all the content mining would have been completed during the design phase. However, more content mining may be justified if you feel more reuse is possible, or if you believe other similar LOs exist in the database.
- **Tools for Authoring or Assembling LOs:** LO tools will either let you author content or assemble content into the database. Assembly tools have you upload completed content, practices, and assessments into the database to build structures (that is, course hierarchy) of your solution. Other tools, however, give you more authoring features, such as creating text, bullet lists, tables, practice questions, and assessments. However, no one tool does everything, so the use of traditional media tools for creating sound, graphics, simulations, or video is still necessary.
- **Tools for Reviewing and Editing:** Depending on your LO tools, the review and editing of LOs should improve. During alpha and beta reviews it may be possible for the editing teams to submit comments directly to the LO database. You can then run a report listing those comments. However, if your reviewers are used to traditional tools to mark up documents (such as version compare), entering comments in a web form may be a significant change.
- **Reusing and Repurposing LOs**: LO authoring tools allow you to find and reuse existing LOs and media elements. Connecting to LOs and media elements means they will appear in the hierarchy of your solution. This type of reuse maintains a connection to the original LO, allowing the owner of that LO to make changes that automatically cascade into your solution. For example, you decide to reuse an LO called "What Is a Pencil?" through a database connection. The owner then adds another type of pencil to the definition. Because of the database connection with the original, that new definition appears in your solution.

  On the other hand, you can elect not to connect to an LO, but instead may make a copy of it to repurpose. By creating a copy, you break the connection with and dependency on the original LO. The problem with this method is that it leads to many copies of similar LOs in the database. If every author repurposed a small percentage of the LO "What Is a Pencil?" the database would be littered with multiple LOs that are so similar that authors and performer may find it difficult to distinguish between them.
- **Writing Style and Guidelines:** To ensure maximum reuse, granularity, and delivery options, writing style and editorial guidelines are critical. For example, your reuse strategy may dictate that each object should stand alone, without referring to those objects that came before or after it. This may affect the flow and context of a series of objects, but allows that object to be placed into any other structure.

  For example, to create a learning object called "What Is a Chair?" you may write a short introduction, a concise definition, example, nonexample, and analogy. Each of these objects is a small logical block of knowledge that supports the concept of "chair."

  You may also need to change the language used in the LO, especially when calling the performer to action. For example, a traditional practice for a workbook may state, "Draw a line between two points," while the e-learning states, "Drag and drop the correct item to its target." The action could become delivery agnostic by stating, "Match the two columns."
- **Write, Modify, or Validate Metadata for Each Object:** Each LO and media element requires a set of metadata tags. Some tags are maintained by the system (author, dates, media type, hierarchy, size, etc.), while others are the responsibility of authors (description, objective, title, owner, key words, competency, etc.). Without valid metadata, most of the benefits of having LOs stored in a database are lost. Therefore, plan on budgeting resources for authoring, reviewing, and editing metadata. For more information on metadata, read "IMS Meta-data Specification," available at www.imsproject.org.

Stage 4. Delivery and Access

In this stage, the performance intervention is made available to the performer. Performance interventions could include an instructor-led course, training web site, virtual classroom event, job aid, and so on. The idea of access has been added to this stage to reflect knowledge and skills beyond traditional events to include help systems and performance support.

What's the Same

Two areas that will not change when adopting LOs include releasing the solution and ensuring organizational support for the solution.

What's Changed

Like other aspects for the LO process, what changes depends on your systems and tools for deploying LOs. With that in mind, here are three areas that are likely to change:

- **Other Ways to Access the Solution:** The performer may access the LOs as bookmarks, as just-in-time training, or as job aids. Performers may download the LOs to personal digital devices or laptops for reference off line.

Access also includes the performer's ability to log into the system and get personalized delivery of LOs based on language, media choices, and learning preferences.

- **Beyond Events:** A traditional instructor-led training event would meet at scheduled times, while a sophisticated LO delivery system opens up the possibility that the same LO could support on-demand training and performance support.
- **Tracking Usage:** One of the many possible benefits of delivering LOs is the ability to track their use. The challenge, however, is how to track the use of job aids, downloads, bookmarks, or access to embedded help systems. Often, learning management systems (LMS) are set up to track events in time such as a class, limiting the reporting and tracking of the other possible access options for LOs.

Stage 5. Maintain and Retire

This is a separate stage because of the possible maintenance and retirement issues for reused LOs. LOs being used by multiple authors, courses, performers, and delivery solutions makes simply updating an object, or deciding to retire the LO, a bit more complex than in the traditional process.

What's the Same

Event though this stage is unique to the LO process, these two areas should be in your current process:

- Keeping the solution up to date
- Using evaluation data to help determine maintenance choices

What's Changed

Here are three new areas that are critical in the maintain and retire stage of the LO process:

- **Ability to Update Parts Instead of the Whole:** It is possible that your evaluation data indicate that additional media options, additional languages, new practice types or other learning strategies may be added to the LO. For example, you may have a single LO that consists of a static graphic and simple multiple-choice practice. While this was fine for the initial release of the solution, you now can go back and add a dynamic animated graphic and more robust practice or simulation. The system may automatically alert the performer that such an update has been made to a LO they had already accessed.
- **Retiring an LO:** At some point an LO may become obsolete. At that point you'll want to remove the object or make it inaccessible to the performer. This is more complex if the performer has bookmarked the learning object, uses it as a job aid, or has downloaded a local version to their personal computer or digital assistant.

  In a perfect world you own all the LOs in your solution and no one else has linked to those LOs, giving you the right to retire them as needed. If however you have reused LOs in your solution and the owner retires them, that change would cascade into your performance solution. To help avoid this problem, systems, business rules and notification processes are needed to manage the retirement and update of LOs.
- **Cost of LOs:** It is possible that some of the LOs in your solution have internal or external charges for their use. It is also possible that charges for reused objects could change over time, which may impact how you resell those objects to the performer. Some charges may also be applied to the performer. For example, a static HTML course may be free for the performer to access, but the live hands-on lab using remote equipment might have a fee for its scheduled use.

Conclusion

This article has presented many aspects of the ISD process that may change when you adopt a process to build performance solutions out of LOs. Keep in mind that the points made in this article are based on my experience over the last three years of implementing LOs at Cisco Systems; this isn't a complete list of changes in the LO process, as that will depend on your current process, adopted LO strategy, LO tools, and business goals.

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Over the last four years, **Chuck Barritt** has been a Program Manager working on the Reusable Learning Object Strategy and its implementation at Cisco Systems. Chuck's responsibilities include internal consulting on learning objects, supporting the author community, and creating LO templates and standards. He also works on improving the strategy through evaluations, research, author feedback, and participation with external standards groups. Prior to his work with Cisco Systems, Chuck was also a part of an LO-based project at Oracle, Corp. He has more than 10 years of experience in e-learning, instructional design, and performance support development. Chuck holds an MA in Instructional Technology from California State University, Chico. He may be reached at cbarritt@cisco.com.