

Meet Me in RIO: Implementing Reusable Information Objects

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Reusable information objects and reusable learning objects are the building blocks of e-learning courseware and e-documentation. A strong business case can be made for implementing a single-source content repository for RIOS/RLOs to achieve reusability between enterprise applications.

Keys to achieving reusability include: an effective meta-tagging scheme, appropriate levels of granularity, and adherence to standards such as the SCORM.

REUSABLE INFORMATION OBJECTS

Increasing channels available for publishing technical information and training materials have created a need for single-sourced, media-independent content objects. These chunks of shared content are termed reusable information objects (RIOs).

RIOs are related to, but not the same as objects used in the IT domain for object-oriented programming (OOP). Programmers work with and refer to generic “objects” that are often just units of code used in the OOP process. RIOs, on the other hand, always contain information for presentation to the application user.

RIOs are used as building blocks to construct traditional paper documents or a wide variety of applications for electronic and web delivery. The following can be said about RIOs:

- They are discrete chunks of shared, raw content meaningful to the application user
- They may be blocks of text or media objects
- Metadata tags are essential components
- Appropriate granularity and use of context wrappers allow RIOs to be used in a variety of applications

REUSABLE LEARNING OBJECTS

Reusable learning objects (RLOs) are self-contained instructional components consisting of an assembly of RIOs and instructional elements such as practice and test items. An RLO serves an identified instructional objective and comprises a unit of instruction, usually for web delivery. Sequencing an appropriate series of RLOs and adding essential information can create a course or

other instructional module. RLOs are the reusable building blocks of a course, but to be effective they are employed with a non-reusable context wrapper—information that customizes the instruction to the target population and provides a segue between RLOs.

For e-learning, RLOs are sequenced and served up to a browser as a complete lesson or course by a learning management system (LMS). For interoperability and reusability, RLOs must be designed to standards such as the Shareable Courseware Object Reference Model (SCORM) (1).

You can think of RIOs as elements that have a high degree of granularity and are free from instructional connotations. A RIO is like a single Lego block (2). Put the Lego blocks together, add some gears, rubber bands, and wheels, and you have a simple machine. Put RIOs together and add instructional enablers (e.g., test and practice items) and elements to provide a context, and you create RLOs.

BUSINESS CASE

Consumers and business customers have become accustomed to easy access to high quality information on the Internet. E-learning is becoming widely embraced, and many companies are racing ahead to provide web-based training and performance support applications. Yet for most companies, there is still a need to publish paper documentation. As technical writers, instructional designers, and web content authors labor to create applications, they face significant challenges:

- It is impractical to find previously-produced content so there is a great duplication of effort
- Content can not be displayed in multiple media, and there is a lack of development standards to produce for multiple media

Information that must be re-purposed must generally be recreated. This problem is becoming huge as information increasingly is targeted for web as well as paper media. This issue is magnified by the use of many different propriety desktop applications in use across the typical enterprise.

A proposed solution to this problem is to implement a new process for authoring content as RIOs and storing them in a shared database. There are two major pieces to this solution:

1. Reengineered authoring processes for creating media-independent content and a standard schema

for structuring information. These would be implemented with—

- XML-structured content that conforms to SCORM standards.
- DTDs, XSL style sheets, etc. developed for various applications (manuals, web-based training, and web-based performance support systems, etc.).

2. A content repository consisting of media-independent, meta-tagged objects

BENEFITS

The goal is to produce an efficient, replicable process and enterprise-wide standard for creating and employing media-independent information objects to represent technical information in all supported languages. Implementing the architecture and required processes are expected to create the following benefits for the enterprise:

Increased Productivity

- Redundant work by technical writers and illustrators will be reduced. A shared content repository will enable RIOs to be shared between disciplines and functional areas.
- Users of technical information will spend less time searching for technical content.
- Adoption of XML will open access to a new generation of improved authoring and content management tools with associated productivity enhancements.

Improved Quality

- The organization's most valuable, highest quality content will be more readily saved, distributed, and enhanced.
- Information in all formats will be more consistent, accurate, and timely.
- Content will be more easily marked as being targeted to specific audiences and media.

Reduced Cost

- Reductions in duplicated work will result in more value-added activities and fewer development hours required.
- Translation costs will be reduced as common information blocks are shared across the enterprise.
- Printing and distribution costs will be reduced dramatically as content is increasingly distributed electronically.
- Deliverables in multiple media will be more easily assembled and formatted automatically via scripts and style sheets.

Enhanced Timeliness

- Problems with logistics and printing/publishing time requirements will be significantly reduced.

- Content developers will have more control over distribution timeframes and find it easier to meet deadlines.
- Improvements in content will change in all deliverable media simultaneously.

GENERAL ARCHITECTURE

The components required by a large enterprise to implement this solution are depicted in the following figure. The centerpiece is the content repository from which RIOs are drawn to assemble multiple applications. A content management layer controls versioning, access by authors, and distribution. Other key components include:

- Learning management system—a key enabler for e-learning. A comprehensive LMS application supports a full range of training administration tasks such as enrollment, scheduling, maintaining training histories, and matching learners to desired competencies and learning resources. Some LMS applications include content authoring tools that ensure standards-compatibility. Ideally, the LMS will dynamically assemble instructional modules and serve them up on demand.
- Portals—the gateways through which users access resources. Separate portals are shown in the figure to accommodate employees and non-employees.
- ERP application—the enterprise resource planning software that supports key business functions such as order fulfillment, customer service, materials procurement, etc. The ERP application is shown in the figure because its functionality may overlap with the LMS that is used to support employees. One of the key and challenging tasks in designing the system is to define how the ERP application and the LMS interface. It doesn't make sense, for instance, to store employee data in two (ERP and LMS) databases. And if both the ERP application and the LMS have the capability to schedule instructional resources, a decision must be made about where to implement that function.

DESIGN CONSIDERATIONS

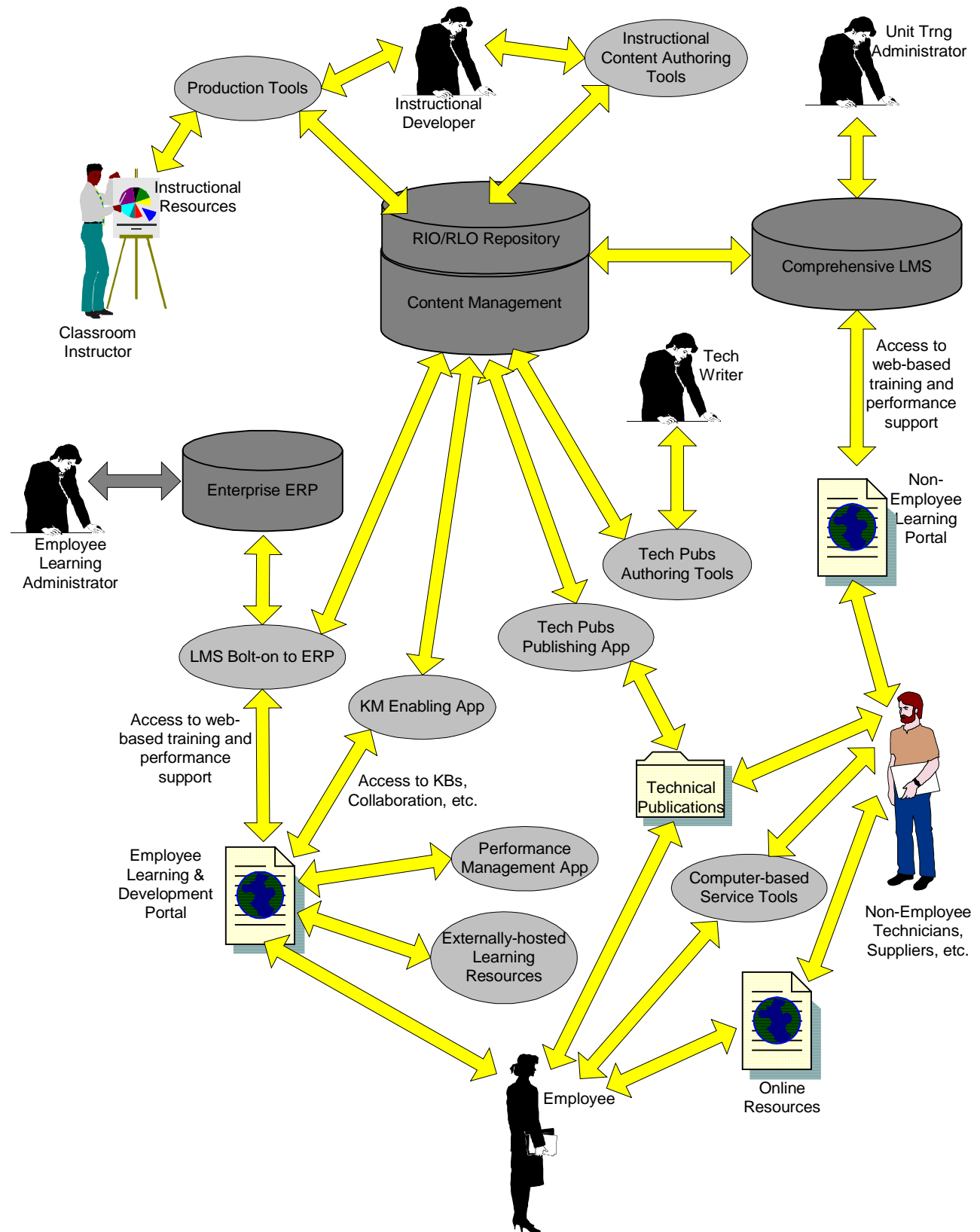
The first key to effective RIO design is to select the appropriate level of granularity. The advantages of fine granularity are:

- Greater potential for reuse
- Greater variability for constructing applications
- Possibly easier to avoid context-contamination

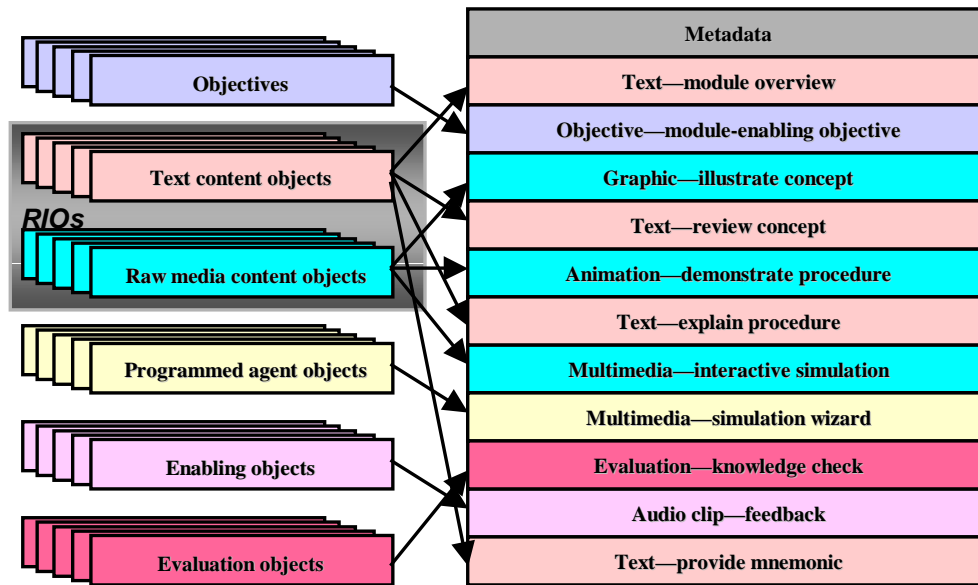
On the other hand, fine granularity means there are more:

- Objects to tag and manage
- Transitions and context wrappers to create

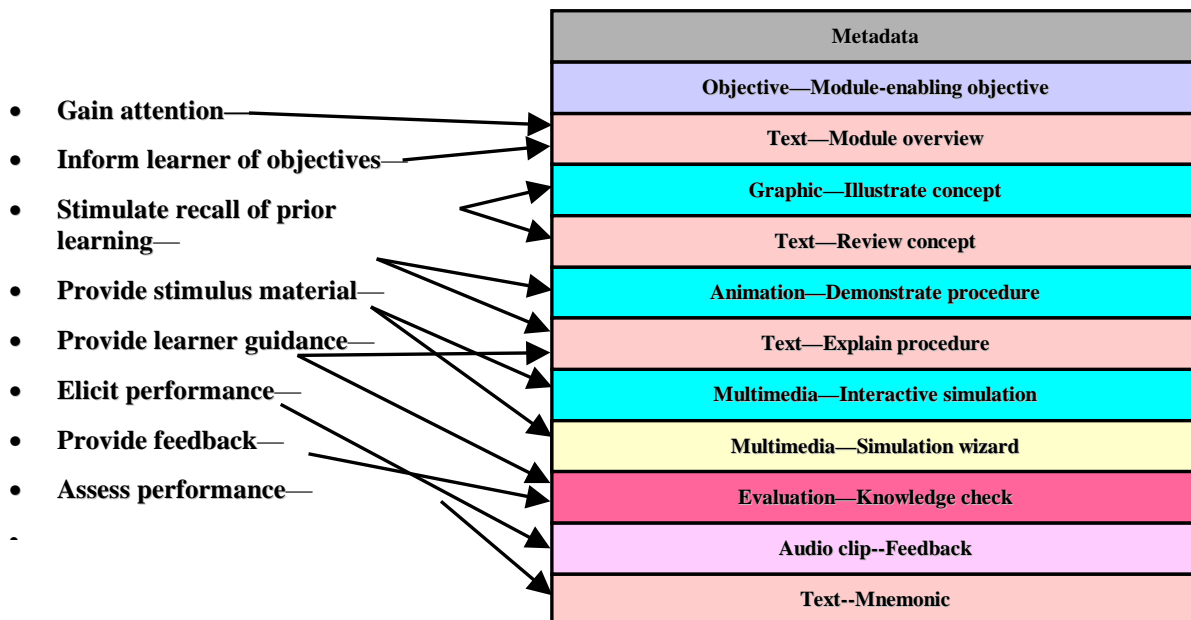
RIO DELIVERY—MAJOR SYSTEM COMPONENTS



SIMPLE RLO EXAMPLE



SIMPLE RLO INSTRUCTIONAL STRATEGY



My recommendation is to keep RLOs free from instructional connotations. This is in contrast to the model proposed by Cisco Systems (3) in which RLOs consist of 1) content items, 2) practice items, and 3) assessment items. Using such a model will severely limit reusability to instructional applications.

The second key to effective RLO design is to employ an appropriate tagging scheme. To some extent this task is mitigated by adherence to standards such as the SCORM, for instance, which provides a general course/document structure and defines required meta-tags. There is still a need for well-defined taxonomies, design strategies, and design templates.

RLO Design

The figure above illustrates first, a simple, generic RLO with the source of components. The contributing RLOs are used to serve a number of purposes, but they are limited to content that is more or less context-free.

The second half of the figure above illustrates the instructional strategy (in this case, based on Gagne's events of instruction (4)) used to create the RLO. This is an extremely simple and conceptual example, but instructional designers will understand the complexity of composing an effective RLO as opposed to the relative simplicity of stringing RLOs together to create online documentation.

Effective e-learning applications fall into one of two instructional styles. The first, by far the most common of the two, takes a behavioral approach. Basically, a stimulus is presented, performance is elicited, and feedback is provided. Generalizing, it's probably fair to say that courses that take this approach are not particularly interesting.

An alternate approach is constructivist in nature and involves the learner in guided discovery through simulation and engaging problems that allow for some flexibility in solving. Generalizing again, it is probably true that courses that follow this approach are considered by learners to be more compelling, more motivating, and, for certain cognitive skills, more effective.

One of the unfortunate truths about RLOs is that they are much better suited for simple behavioral training models rather than guided discovery models.

REFERENCES

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