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From Discovery to Innovation...

Design and Reusability of Learning Objects in an Academic Context: A New Economy of Education?

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eLearning: a challenge for universities.

Milan, November 12, 2002

Context

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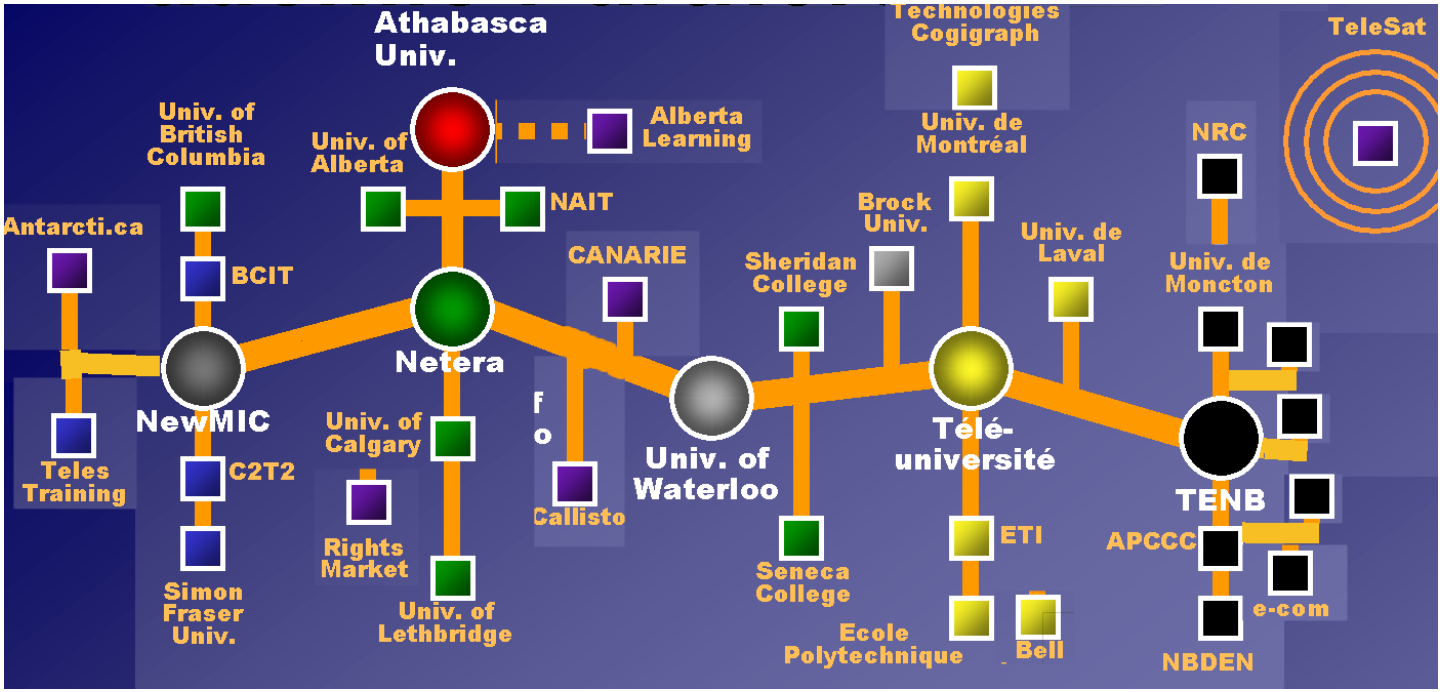
Context (2) eduSourceCanada



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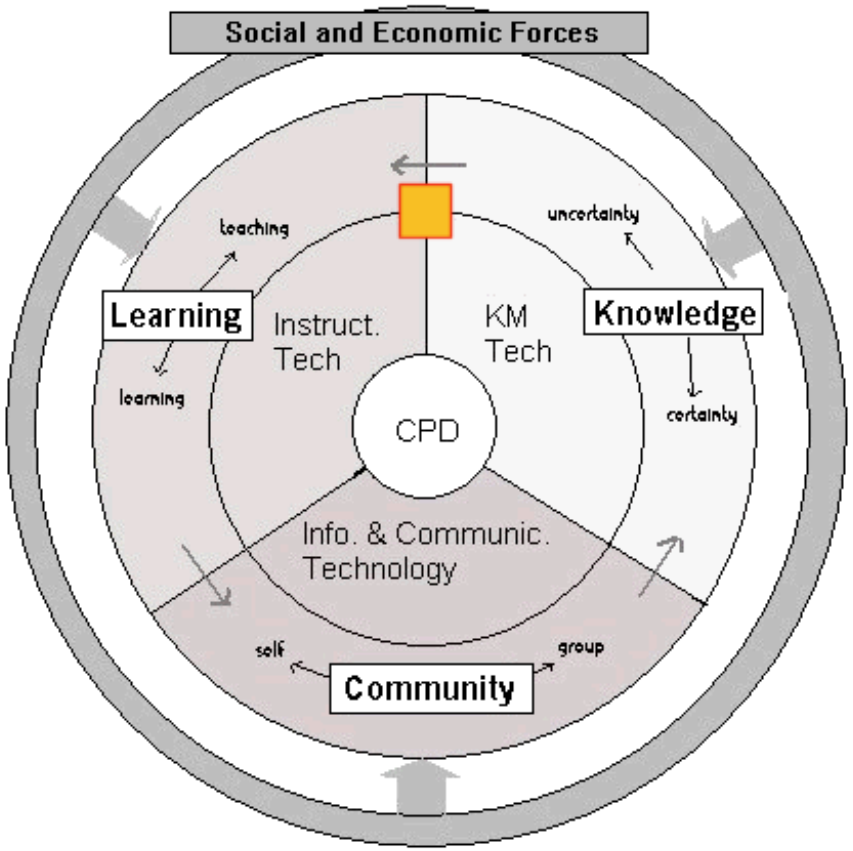
Context (3)



This presentation looks at a small area in the overall picture of online learning

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Theme

- The purpose of this paper is not to discuss the creation and use of learning objects *per se* but rather to look at systems for locating and distributing learning objects.
- A distributed model of learning object repositories is proposed. This model is based on a set of principles intended to create an open and accessible marketplace for learning objects, in essence, a learning object economy.

Contents

1. Introduction

- Two definitions of learning objects:
  1. IEEE, Wiley: any digital resource that can be reused to support learning
  2. Used in this paper: anything that is exchanged in what may be called the learning object economy.
- Note that this definition does not require that learning objects be of explicitly pedagogical design, and it does not require that the resources *themselves* be digital

2. The State of the Art

- Brief descriptions of common methods of locating and retrieving learning objects, specifically:

1. Course Portals
2. Course Packs
3. Learning Object Repositories
4. Learning Content Management Systems

2.1 Course Portals

- A website offered wither by a consortium of educational institutions or a private company working with educational partners that lists courses
- The purpose of a course portal is to enable a student to browse through or search course listings to simplify the student's selection of an online course.
- Examples: TeleEducation, Unext, Hungry Minds, Fathom

2.2 Course Packs

- Offered primarily by educational publishers
- Packages of learning materials collected to support a course.
- The instructor is expected to supplement the course pack with additional content, educational activities, testing and other classroom activities.
- Examples: WebCT Course Packs, XanEdu, MarcoPolo, Canada's SchoolNet

2.3 Learning Object Repositories

- Databases containing either
  - learning objects and learning object metadata, or
  - metadata only
- Most common form is a centralized database in which the learning object metadata is located on a single server or website and learning objects are located elsewhere
- Examples: Merlot, CAREO, POOL, NSDL

2.4 Learning Content Management Systems

- To create a course, therefore, a set of learning objects must be assembled into a package.
- Packages are created using a Learning Content Management System.
- Two major functions:
  - Provide authors with a means of locating learning objects,
  - Assemble learning objects into standards compliant learning packages (or courses).

3. Problems and Issues

- In general the issues have to do with system architecture and resource based on what I call the "**silo model**."
- On this model, resources are not designed or intended for wide distribution. Rather, they are located in a particular location, or a particular format, are intended for one sort of use only.
- The silo model is dysfunctional because it prevents, in some essential way, the location and sharing of learning resources.

3.1 Proprietary Standards

- A standard is proprietary when it is secret or when patents, copyrights or other restrictions prohibit its use.
- The use of a proprietary standard divides a distribution network
- Risks of proprietary standards:
  - Lack of support in new software
  - Licensing terms may change
  - Standards holder enjoys technological advantage
  - Choice of viewing software may be limited

3.2 Strict Standards

- It may be the case that the standard is too limiting for widespread use. (e.g. Criticisms of SCORM)
- In a similar manner, transport protocols may also be too strict.
- If the standard is too complex, use of the standard requires an involved process or development tool.

3.3 Monolithic Solutions

- Learning content management systems have become tightly integrated monolithic software bundles
- Purchasers of such systems are as a consequence committed to a single solution for all aspects of learning management – 3rd party solutions cannot be 'plugged in'.
- Issues:
  - Purchasers buy more than is desired
  - No means to outsource services

3.4 Closed Marketplace

- Exists when an owner of a learning content management system has only a limited selection of content to choose from.
- Usually established *via* exclusive licensing deals
- Issues:
  - It is difficult to access content from different libraries
  - It is difficult for new content providers to distribute their material
  - The system tends to favour large distributors, large institutions

3.5 Disintermediation

- A system is disintermediated when there is no form of assessment or review guiding the selection of learning resources.
- Some efforts to provide intermediation. Eg. Merlot's peer review process – but these are limited to a single repository and select body of reviewers
- Review often used as a 'gate-keeping' process, causing significant backlog
- In many system, no review available at all

3.6 Selective Semantics

- The tendency to view the network of learning objects and repositories as a stand-alone service on the world wide web, not integrated with or compatible with many other resources and services available
- An issue mostly of perception rather than implementation
- A network, for example, that standardized on SCORM would preclude from consideration resources which are useful to course designers but which may not be described as learning objects *per se*.

3.7 Digital Rights Mismanagement

- Major issues:
  - No simple DRM solution has been widely implemented.
  - In many implementations, digital rights management has been conflated with the idea of digital rights enforcement
  - Often a requirement to use specialized technology, software
  - Typically necessary to negotiate access with each separate supplier
  - No trusted fiduciary agents

4. Design Principles

- Intended to govern the development of an architecture for a distributed learning object repository network (DLORN)
- The purpose of the principles is to guide the description of the components employed, the standards followed, and the principles governing the operation of the network

4.1 Open Standards

- Protocols should be described, documented, and freely available to the public at large
- Purpose is to encourage interoperability with external systems, eg., libraries, museums
- Standards should be royalty free to ensure there are no *a priori* costs to implementation
- Enable, don't require

4.2 Infrastructure and Services Layer

- *Infrastructure Layer* - The set of components in the infrastructure layer will be developed and distributed as royalty-free open source software
- *Service Layer* - components with increased functionality, offering an improvement in design or services over and above the functionality provided by the infrastructure layer

4.3 Component-based, Distributed

- Designed not as a single software application, but rather, as a set of related components, each of which fulfills a specific function in the network as a whole
- Any given component of DLORN may be replicated and offered as an independent service
- It is anticipated that there will be multiple instances of each component of the DLORN infrastructure
- Provides robustness, ensures there is no bottleneck over which a single supplier or service has control

4.4 Open Access, Open Market

- *Open Access* - Any provider of learning materials may prepare and distribute learning materials through DLORN
- *Open Market* - No prior restraint imposed on the distribution model selected by participants in DLORN
- Purposes:
  - To allow different business models
  - To ensure that users are not locked in to one supplier
  - To provide widest range of content options
  - To ensure costs reflect true market values

4.5 Semantic Web and Third Party Metadata

- Multiple parties may provide metadata describing a given learning resource
- Purposes:
  - Evaluation of learning materials
  - Annotation
  - Third-party services
- DLORN an extension of the semantic web
  - Should incorporate sector-specific ontologies
  - Offers widest reach possible
  - Reduced duplication of effort

4.6 Digital Rights

- Major principle: simple Digital Rights Management
- Brokered single-source DRM to allow consumer choice
- Consumer rights equally important
- Rights enforcement an application-specific feature

5. The Distributed Network

- What we are proposing is a set of inter-related applications distributed over the internet and communicating with each other.

5.1 Creating a Network

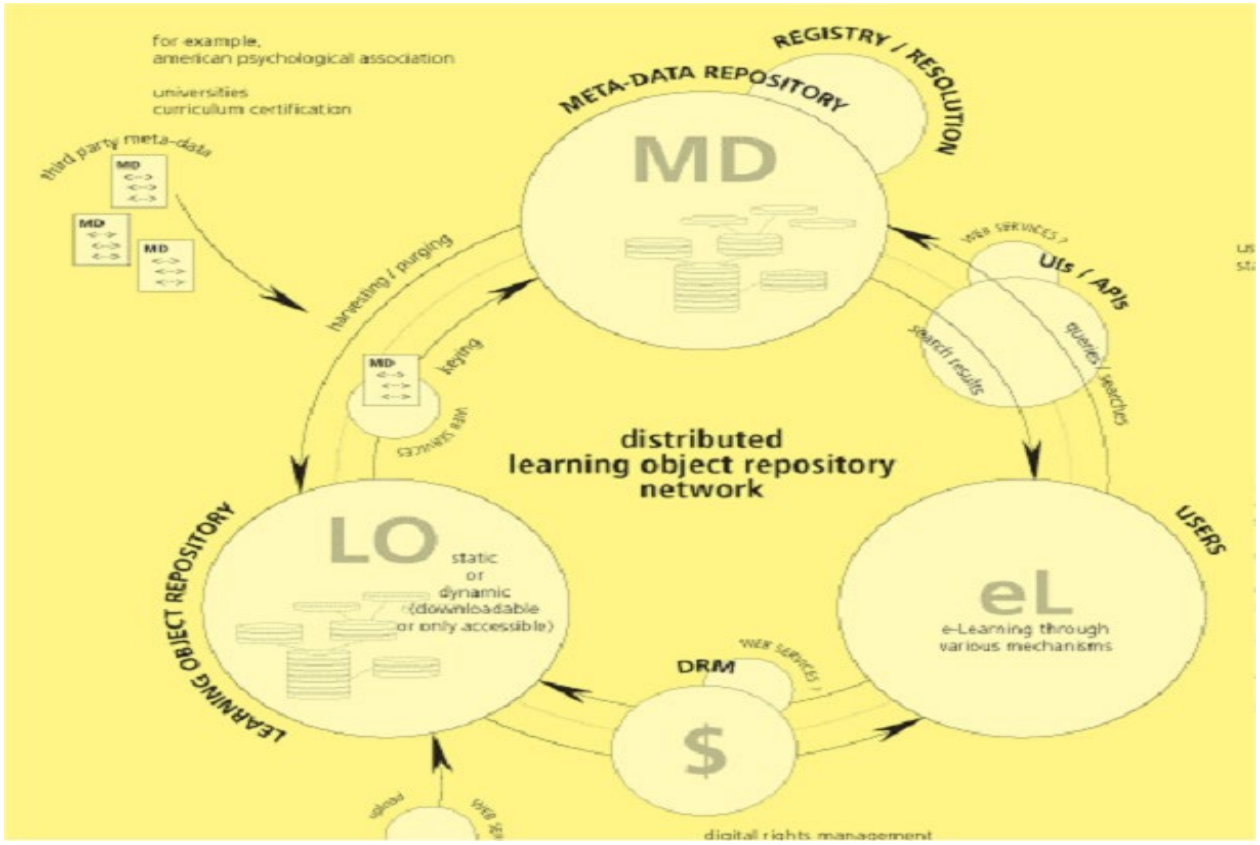
- Three major steps:

1. Separating the functionality of an LCMS / LMS architecture into distinct, stand-alone components that communicate over TCP/IP
2. Allowing (encouraging) the development of multiple instances of these components
3. Providing indexing or registries of these instances

5.2 Core Components

- Learning Object Repository – hosted by vendors on vendor sites, provides vendor metadata and learning object servers
- *Metadata Repository* - hosted elsewhere, harvests metadata from vendors and amalgamates, allows queries from eLearning systems.
- *eLearning system* - queries metadata repository, user selects resource, retrieves resource from learning object repository, displays

Core Components (2)



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5.3 Contrast to Library Model

- Most implementations view learning objects as though they were books in a library that are acquired, indexed and deployed
- This implementation views learning objects as online services and includes:
  - Learning objects, properly so-called
  - Other academic work, such as journal articles
  - In-person classes and seminars
  - Access to instructors, coaches and tutors

5.5 Component Registry Service

- In the network proposed, there are multiple instances of each component. It is necessary to provide indexing or registry services.
- A vendor wishing to offer learning objects through the network will need to declare that the repository exists
- The registry system envisioned is consistent with existing approaches to the provision of services on the internet

5.6 Secondary Components

- These include:
  - A system of third-party metadata
  - A digital rights system
  - A learner (user) information system
  - A reporting or tracking system
- Major features:
  - The components are optional: you develop (or buy) them and use them only if you need them
  - For any given component, select one of many instances
  - These components may reside outside your own system

Resources

- This Paper: http://www.downes.ca/files/milan.doc
- A Web Services Primer - http://www.xml.com/pub/a/2001/04/04/webservices/
- The Learning Object Economy – http://www.downes.ca/files/Learning_Object_Economy.htm
- EduSource – http://www.edusource.ca/
- Stephen Downes – http://ww.downes.ca

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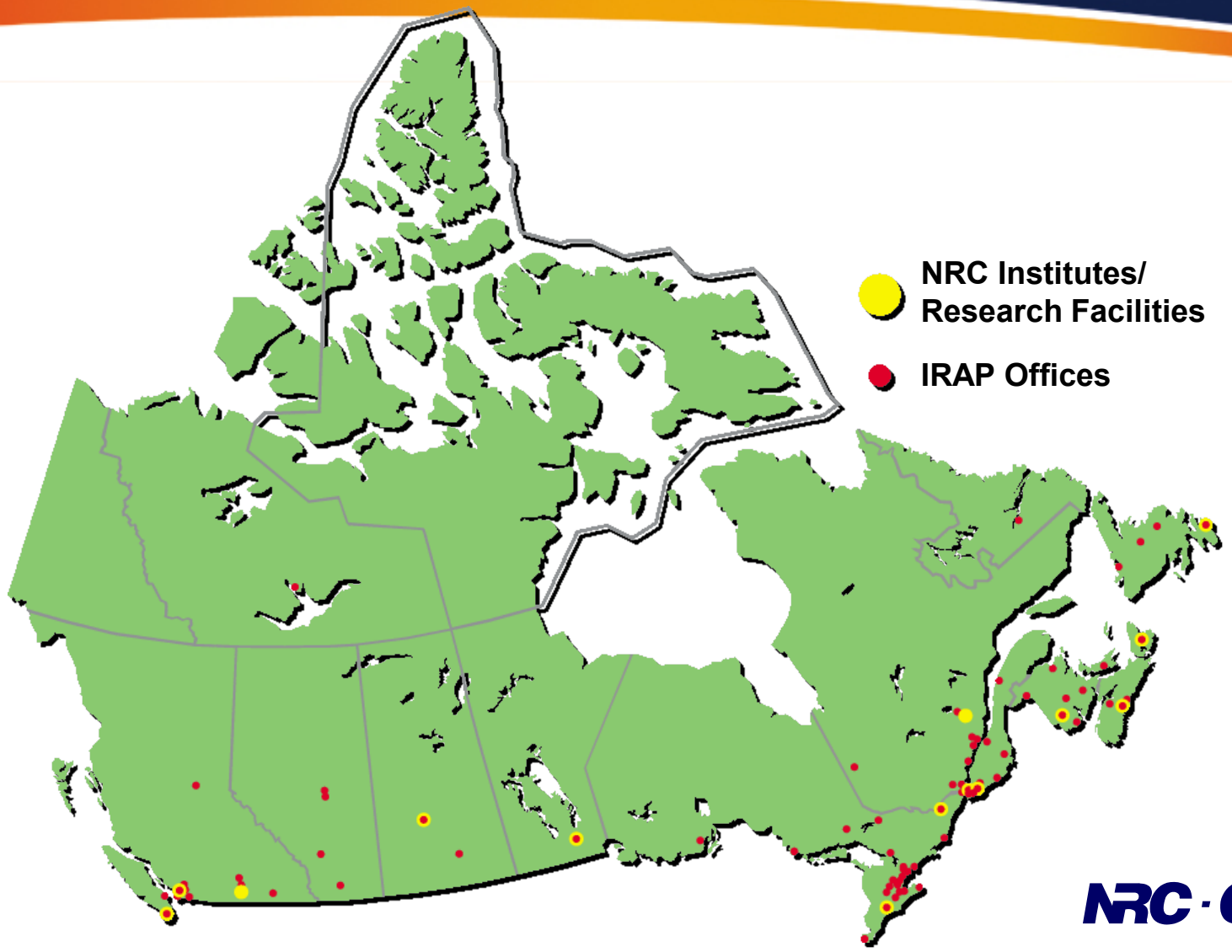

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