

Managing Knowledge with Learning Objects

The Role of a Learning Content Management System in Speeding Time to Performance

A WBT Systems White Paper



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A Complete e-Learning Solution

Learning is one of the most complex of all processes within an organization. Not only has it historically been a very fragmented process with little use made of technology, but the learning and in particular how people learn effectively, varies significantly from individual to individual. It is no wonder then that much confusion still exists in this nascent industry on what a complete e-learning solution looks like.

At its highest level, it is useful to think of a complete e-learning solution as being comprised of three core components, with the organization and learner at the heart. As illustrated in Figure 1 below, these three are: infrastructure, services, and content.

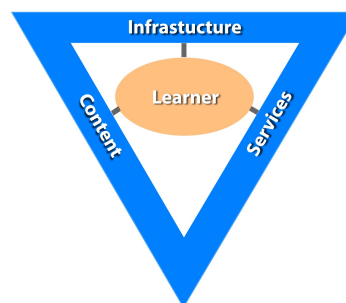


Figure 1: Components of a Typical e-Learning Solution

Infrastructure

Often referred to as the “plumbing” of an e-learning solution, the infrastructure refers to the application-level software that allows all aspects of learning, from classroom to web, to be created, managed, delivered, and measured. This category is further subdivided into products such as Learning Management Systems (LMS) and Learning Content Management Systems (LCMS) as will be discussed later.

Services

Successful implementations of e-learning technology require, as in the case of all enterprise-class applications, appropriate planning, customization, integration, and application management. Any or all of these services can be sourced in-house within an organization or, as is more common, by leveraging the experience and scale of outside consulting organizations. Additionally, and somewhat unique to e-learning, is a class of services associated with the learning process itself such as mentoring or facilitation services provided by subject matter experts (SME) in a third-party organization.

Content

Within an organization content requirements will vary in terms of subject matter, preferred format (text, video, simulations), and language to name just three. Where possible it is typically desirable to purchase pre-existing content from third-party vendors such as in common generic areas such as IT applications. However, the vast majority of content will be industry or organization specific and will have to be captured and created in-house or through the use of local custom content creation houses.

Infrastructure Components

e-Learning infrastructure, like all e-business technologies, builds on classic networking and enterprise infrastructure services and standards such as IP-based networks, web browsers, and database and industry standards such as Oracle, Microsoft Windows, and Sun Solaris.

At the application layer, there are three primary sets of technologies that can be integrated to provide an infrastructure framework for delivering the complete suite of e-learning services. These components are the Learning Management System (LMS), the Learning Content Management System (LCMS), and the Virtual Classroom (VC).

Learning Management System

LMS software products include a database of student records with administration and delivery interfaces for learning. LMS products typically provide functionality such as:

- Competency and skills management
- Skills gap analysis
- Resource management
- Inter-connectivity with VC, LCMS, and enterprise applications

Learning Content Management System

LCMS software products are primarily responsible for creating, managing, maintaining, delivering, and tracking web-based content and provide functionality such as:

- Content migration and management
- Learning Object repository
- Content reuse and adaptive individualized learning paths based on Learning Objects
- Asynchronous collaborative learning via email and discussion groups
- Testing and certification
- Inter-connectivity with VC, LMS, and enterprise applications

Virtual Classroom

Virtual classroom technology is designed to support synchronous collaboration by allowing a live classroom experience to be conducted over the Web. It includes functionality such as:

- Voice over IP (VoIP)
- Video conferencing

- Shared whiteboards, application screen sharing, and live feedback
- Archiving of classes as Learning Objects
- Inter-connectivity with LMS and LCMS

Recently as e-learning has begun to come of age, Global 2000 and other organizations have begun to leverage the use of e-business technologies for enhancing the running of their learning and training programs. This led to the emergence of the Learning Management System category as an infrastructure solution. LMS solutions are focused primarily on cost displacement by administering existing classroom training through the Web, focusing on elements such as catalog and registration, resource management, and back-office financials.

LCMS solutions however are a class of software products that include a Learning Object repository with authoring and delivery interfaces for e-learning and knowledge management and are designed to support the rapid capture, delivery, and measurement of knowledge in a web-based fashion. Learning Content Management Systems like TopClass from WBT Systems are focused on achieving “personalized learning on demand” to drive performance in an organization by delivering content to learners to solve business problems.

Personalized Learning On Demand

The concept of personalized learning on demand evolved from ten years of research carried out by the founders of WBT Systems as part of a consortium of higher education and private industry focusing on distributed learning technologies. These core principles, which are the foundation of the TopClass LCMS, are:

People Learn in Small Chunks

Even in the extreme example of a 4-year degree course, the reality is it is comprised of many thousands of smaller discrete learning events. Key to promoting speed of delivery, maintenance and effectiveness of e-learning is recognizing this. Support for learning in small chunks is typically provided through a Learning Object based management system.

People Learn by Collaborating

For 6,000 years of human civilization, we have learned in groups. From the first village storytellers to the latest MBA seminar, the collaboration that takes place among learners and mentors promotes better understanding and contextualization of learning. Embracing the power of collaboration through asynchronous tools, like discussion groups, and synchronous tools, like live classes over the Web, not only enables more effective learning and promotes motivation, but these collaboration objects themselves can be captured and become Learning Objects for the next set of learners.

Support the Rapid Capture & Turnaround of Knowledge

The lifetime of knowledge is shortening all the time, so clearly the ability to rapidly capture that knowledge and make it available to those that need it in a timely fashion is key.

Learning Should be Tailored to the Needs of Individual Learners

Most of us by now have experienced purchasing a book from Amazon or using My Yahoo!. This has created an expectation that web technologies should be capable of adapting themselves to our own preferences. This should certainly be true for learning which is perhaps one of the most subjective and personal areas of our lives.

Support Organizational Business Rules

Clearly we must be able to support the economic and business imperatives that drive our business which includes everything from formal legal training requirements such as OSHA or other regulatory compliance, to more informal business requirements, such as product knowledge or organizational value systems.

Most Fundamentally, Learners Control What, When, Where, & How

e-Learning gives us an unprecedented opportunity to empower our employees, partners, and customers to control (within the bounds of the previous point) what they learn, how they learn it, when they learn it, and where. Nothing drives success for an organization more than a smart and well-educated workforce empowered to do their jobs more effectively.

Speeding Time to Performance

Personalized learning on demand is all about reducing the time to performance. You can think of time to performance as the period of time that elapses from the initial creation of the knowledge or learning (which is often not done in an electronic form) to the ultimate ability to apply that knowledge in a practical situation by a learner. This means moving beyond proficiency to performance - the ability to apply the new knowledge or learning in a new context. It encompasses the entire learning lifecycle from authoring or creation to delivery and mentoring and finally to application of that knowledge.

The more an organization can minimize the time to performance throughout its supply chain (encompassing employees, contractors, partners, vendors, and customers), the more it will impact on the top line of that organization.

For example, the faster and more thoroughly a high tech product company can get their own sales people trained on the introduction of a new product, the sooner the product can be effectively brought to market and generate revenues.

The Business Benefits of a LCMS

A Learning Content Management System allows an organization to:

Compress the learning lifecycle

While we cannot eliminate any of the fundamental steps required to capture and deliver knowledge (as shown in Figure 2 below), we can compress the time taken within each step.

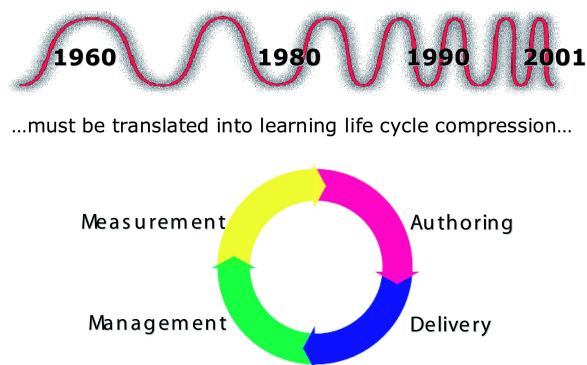


Figure 2: Learning Lifecycle Compression Driven by Business Lifecycle Compression

Authoring

By providing tools that support the rapid migration of legacy content such as PowerPoint and Word files, this allows an organization to leverage the knowledge assets it already has invested in developing. Putting these authoring tools directly into the hands of the Subject Matter Experts (SMEs), without requiring them to learn proprietary new tools, leverages their expertise.

Delivery

Providing just-in-time, just-enough delivery over the Web, in both an online and offline format, permits the rapid dissemination of knowledge and access to the Learning Object library at any time.

Management

Providing tools to support all management aspects of creating, delivering, and tracking web-based learning enables management of large numbers of user and Learning Objects across dispersed, multilingual environments.

Measurement

Providing testing and certification enables regulatory adherence and other forms of compliance as well as return on investment analysis and reporting.

Promote Content Reuse

A Learning Content Management System and in particular its Learning Object foundation provides an opportunity to think differently about how e-learning is leveraged and to promote content reuse in a number of ways:

Share Learning Objects Across Courses

Migrating content into Learning Object form allows us to reuse significant chunks of contents across groups of learners. The result is money saved while more relevant content is delivered faster to each group.

Take for example a course on the introduction of a new release of a software product. Typically significant elements of this course will be the same as in the previous version. In the old monolithic course structure, it would be necessary to start again and develop the entire new course from the ground up or at best go through the laborious process of breaking down the old course to extract the salvageable elements. With a LCMS and a Learning Object architecture, the old course and the new course can both be delivered from the same exact set of Learning Objects, tailored for each version of the software. In this way you leverage, for example, the 80% of the content that is common and supplement that by weaving in the 20% that is different for each course or group of learners.

Reuse Content in Different Ways

Once content is managed as Learning Objects in a single library, that content can be reused across what have been traditionally thought of as very separate delivery scenarios (Figure 3) - from very formal training events (such as a typical 8-hour online self-paced class - 1000 Learning Objects) to less formal performance support scenarios (such as a 30-minute job aid - 10 Learning Objects) to very informal business communication (such as a single question and answer - 1 Learning Object). The leverage comes from learners having access to the Learning Object library and the fact that in essence the Q&A is potentially a subset of the performance support content which is a subset of the formal self-paced class content. Each course is a subset of the prior course's content.

Lower Maintenance Costs

The initial creation and delivery of the course is only the beginning of the reduction in time and costs associated with the learning process. As the courses evolve over time, they can be reused as described in the previous example. Additionally, only one copy of each individual Learning Object exists, so as the master copy is updated, this change is automatically reflected for every course that is referencing it anywhere on the system. This allows maintenance costs, which are often hidden and unforeseen, to be dramatically reduced.

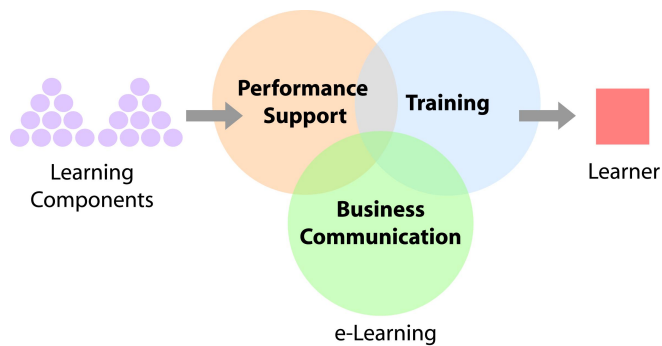


Figure 3: Leveraging Content Across Different Learning Event Types

TopClass: The Proven Learning Content Management System

The first wave of e-learning was focused on cost displacement solutions associated with administering classroom training, i.e. the LMS. However, the market has matured and expanded to a second wave of adopters who want a more sophisticated e-learning solution. This second wave requires a Learning Content Management System to fulfill the needs of personalized and adaptive e-learning along with the economic benefits of reusable Learning Objects.

Learning Objects that are standards-based are a key requirement to ensure that your content investment is protected by allowing the content to be deployed across different environments with different products. TopClass leads the industry in open standards support. It supports XML and SCORM and is the only LCMS that is certified as AICC compliant.

What is TopClass?

TopClass is designed to manage the mapping of content to learners to solve business needs. An overview of the integrated architecture of the TopClass product family is shown in Figure 4.

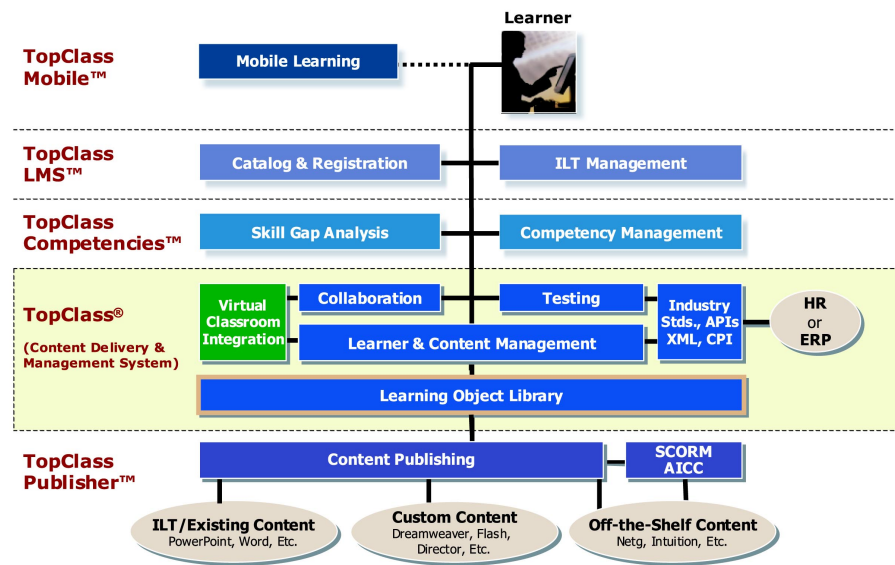


Figure 4: TopClass Integrated Architecture

Content Development & Migration

At its most fundamental, this means supporting the capture, migration, delivery, and measurement of three principal forms of content: ILT/legacy content, custom content, and off-the-shelf content:

Existing ILT Content

Content that exists in an organization and is delivered predominantly in the classroom or as Microsoft Word or PowerPoint documents represents by far the majority of content. Tools must be provided to allow a Subject Matter Expert (SME) to easily migrate this content from its legacy format to a web-based Learning Object format.

Custom Content

Content created with more powerful tools such as Microsoft FrontPage or Macromedia Dreamweaver must also be supported. This content may be developed in-house or by outsourced to custom content developers.

Off-the-shelf Content

It is typically more time and cost efficient to leverage pre-packaged content. Typically this content is in focused areas such as desktop applications training or soft skills. Support for off-the-shelf content is typically provided through support for emerging industry standards such as AICC or SCORM, though sometimes requires support for proprietary interfaces the content may use.

Content migration and development in TopClass is supported through TopClass Publisher, a tool designed to support drag and drop migration of content from all three forms into web deployable Learning Object format, leveraging industry and

enterprise standards such as XML, AICC, and SCORM.

Content Delivery, Measurement, & Management

The content management and delivery engine of TopClass is made up of the following components:

Learning Object Library

All content is stored and managed by TopClass in the Learning Object library which supports object-level security permissions to ensure authorized access to appropriate Learning Objects by all types of users from administrators and authors to instructors and learners. The Learning Object library is the heart of TopClass and is managed by the TopClass Context Engine, which is discussed later.

Testing & Certification

To enable formal certification and compliance tracking as well as to adapt learning paths based on an individual learners progress, the Testing and Certification module integrates at the Learning Object level with all content contained in the library.

Collaboration

To promote knowledge sharing as well as speed the time to performance, the collaboration modules includes powerful discussion group and mail functionality and provide tight integration with synchronous virtual classroom tools to support live e-learning. Collaboration objects can be captured and converted into Learning Objects, creating a powerful network effect and further speeding learning through the extended enterprise.

Enterprise Application Connectivity

Built on a powerful XML interface and additional custom APIs, TopClass supports connectivity with many different types of enterprise applications from Learning Management Systems to ERP and HR systems, as well as network authentication schemes such as Windows Unified Login.

Mobile Delivery

Recognizing that learners will need access to content at times when they are disconnected from the Internet or intranet, TopClass Mobile allows any learner to take a set of Learning Objects and download them to their local machine or laptop or to CD or other removable device and have full access to the browser-based learning environment with that content. This includes full access to the search engine, testing capabilities, and adaptive learning technology and supports content and assessment tracking and reporting.

TopClass Delivers

TopClass is powering the e-learning revolution in three ways:

Out-of-the-box Solution

TopClass is a complete “out-of-the-box” web-based training solution for the delivery and management of online training content. It complements instructor-led training and improves the performance of your people in less time with less cost. The power of the TopClass solution is its unique Learning Object architecture.

TopClass:

- Makes it quick and easy to convert and deliver existing content into a web-based course

- Increases speed and ease of course content assembly
- Maximizes value of content assets by making them easy to reuse and update
- Provides the administrative functions required in a total web-based training environment including catalog, registration, and competency

Open Standards Based

Second, TopClass provides an open architecture to integrate best-of-breed products for a total e-learning solution. TopClass complies with industry standards, including AICC, SCORM, and IMS. Using its open APIs, and a powerful XML interface, it also integrates with complementary applications, including Learning Management Systems, Virtual Classrooms, content providers, and ERP systems.

Delivers on the Promise of e-Learning

Third, TopClass provides the foundation to deliver on the “just-in-time, just-enough” promise of e-learning by:

- Facilitating personalized delivery of content based on the individual learner’s knowledge and learning preferences
- Providing tracking and assessment of learners to measure effectiveness and compliance
- Promoting knowledge sharing through collaborative learning
- Serving global workforces through support of multilingual content

Learning Objects Definition

Fundamental to personalized learning on demand and content reuse is a Learning Objects architecture. At its simplest level, Learning Objects are reusable building blocks of learning.

To understand the concept of Learning Objects, think of training material not in terms of “monolithic courses”, but rather as being constructed of a set of smaller components or “chunks” of learning. Learning Objects are building blocks of learning. This is a little bit like building a house. Two different houses may contain many of the same common elements such as the type and number of doors or windows but everyone doesn’t want the exact same house. Monolithic courses assume everyone has the exact same needs in a house and Learning Objects recognizes that it is important to be able to tailor each house based on individual needs but that there are many common elements that the builder can reuse across different houses.

Learning Object Granularity

Some definitions of Learning Objects attempt to quantify how big or small a given Learning Object should be. Typically this is done in the form of a metric such as “it should take no more than 30 seconds to review” or “it should contain no more than 3 individual screens of information”. WBT Systems’ implementation of Learning Objects does not enforce a requirement on Learning Object size because the appropriate definition of size depends on many factors such as: subject being covered, instructional design philosophy applied, and media tools being applied (video versus text only for example). Given an enterprise-wide deployment of a Learning Objects library, it is inappropriate to dictate issues that are clearly the purview of the customer and will vary on a case-by-case, person-by-person basis, even within the same enterprise.

Key Benefits of Learning Objects

- The ability to locate and access learning material in the form of components or chunks that are smaller than entire courses is central to delivering on the promise of personalized learning on demand. Monolithic courses allow for very limited personalization. Some limited personalization can be achieved through basic pre-assessment, but this is typically “hard-coded” into the course by the vendor, is severely limited, and cannot be enhanced or replaced.
- Constructing courses in this manner allows Learning Objects to be reused across many different courses and allows courses to be updated and revised without requiring major changes. These benefits promote cost saving both in developing content (because it can be reused in more ways) and maintenance (because you only have to change one Learning Object to update all courses that use it).

Characteristics of TopClass Learning Objects

WBT Systems pioneered the Learning Object concept in real world implementations and as you might expect, our offering provides deeper functionality and is more mature and proven in its approach.

TopClass Learning Objects (“TLO”) have the following key characteristics:

Default Sequencing

They are structured (“ordered” or “sequenced”) into a hierarchy, much like the table of contents of a book structures it in terms of chapters, section and pages.

Benefit: This means that it is not necessary to select each individual Learning Object you want to have when constructing a course. You can simply choose to use the default structure because when you select a TLO, you automatically get every TLO it contains in the default order.

Separation of Sequencing from Content

The sequence or ordering of the TLOs is managed separately from the content of the TLOs themselves.

Benefit: This means that either an instructor, or more usually the TopClass testing engine, can insert or remove additional TLOs from anywhere in the TLO library into the learning path for an individual or group of learners and that TLOs can be used in many different courses in different ways. The navigation or sequencing for each individual learner or group is automatically managed by TopClass and only one copy of each Learning Object exists.

Independent of Granularity

There is no restriction on how “big” or “small” a TLO should be (i.e. no restriction on how much information or content is contained within a TLO).

Benefit: This means that an author is free to determine the combination of instructional design, visual style, and other aspects of granularity that makes sense for a given topic without having restrictions imposed on them by the system. Additionally, this provides a migration strategy for content that has not yet been broken down into

Learning Object format because an entire monolithic course can be constructed as one Learning Object.

Content Agnostic

They provide the ability to incorporate any content regardless of the vendor or tool that created the content with complete control over content look and feel.

Benefit: Provides a vendor agnostic and tools agnostic enterprise-wide Learning Object library. This provides the ability to incorporate the full spectrum of content types from plain text documents to Flash to very rich audio/video and simulations and puts the choice and control in the hands of the customer/author. It also allows content creators to continue to use any of the tools they are using today (from PowerPoint and Word at the high volume end to Dreamweaver and FrontPage at the midrange to high end tools such as ToolBook, Authorware, and Flash).

Categorization

They provide the ability to not only order the Learning Objects into hierarchies, representing levels of categorization like the Dewey Decimal system used in libraries, but also to “tag” each individual Learning Object or group of Learning Objects with metadata (data about the Learning Object) based on proprietary rules or using emerging industry standards such as IEEE or IMS.

Security

The ability to set security rights at the individual object level to control what types, groups, and individual users have access to view, edit, and assign content.

What is the difference between a TLO and a Media Asset?

TLOs (folders, pages, and tests) typically contain smaller components in the form of media assets. Media assets are any piece of content or object referenced in the TLO. This includes any Java, JavaScript, audio, video, images, or other media type that may be used by that Learning Object. In this context, you may think of the TLO as consisting of three parts:

- The “shell” or container structure including the name of the TLO
- The “core content” in the form of the HTML or XML
- The media assets referenced in the core content

When you perform an operation in TopClass on a TLO such as retrieving, assigning, or exporting, it usually involves all three components.

What types of content can be delivered as TLOs?

Any type of content that can be delivered over the Web may be delivered and managed as Learning Objects in TopClass. This includes all of the common web formats such as Flash, Real, QuickTime, Acrobat (PDF), Windows Media Format, all graphic formats (such as GIF, JPEG and PNG), as well as of course all flavors of HTML and XML (including DHTML and CSS). Additionally, TopClass Publisher includes the ability to automatically convert common legacy formats such as Word and PowerPoint into both a Web-deployable and Learning Objects format simply by dragging them into TopClass Publisher.

The TopClass Context Engine

These key benefits of TopClass Learning Objects are enabled by the cornerstone of TopClass – the TopClass Context Engine (TCE).

TCE manages three levels of context which can be thought of as different “views” of the consolidated Learning Objects library. These three levels are:

Global Context

There is only one global context and it represents the consolidated Learning Objects library with the default structure and ordering of all Learning Objects. It is typically structured based on topic areas (though the particular structuring used is designed at implementation time to suit an individual organizations needs). Content in the global context is not assigned to any classes or learners.

Class Context

To assign content to groups of learners in TopClass, you create a class context. This allows a manager, administrator, or instructor to select elements of the global context and associate them with a class structure and then assign learners to it. Because classes are independent, yet reference material from the global context, Learning Objects can be used in different classes in completely different ways. They can be re-ordered, have additional material added or removed from the default structure, and be tailored to the needs of each group of learners individually. We sometimes refer to this process as “mass customization” or simply “content reuse”.

Learner Context

Learner contexts are automatically created as needed by TopClass. As a learner reviews their content and takes assessments to benchmark progress, an instructor, or more usually, TopClass, can automatically modify the learning path for that individual by adding and removing Learning Objects from anywhere in the global context, without affecting other learners in the same class or anywhere else on the system.

In all context and cases, irrespective of where or how often a particular Learning Object is referenced and used, only one copy of that Learning Object exists. *This means that it only ever needs to be updated in one place.* Further, because of the inheritance and hierarchical structure managed by the TopClass Context Engine, when a Learning Object is updated or further content is added or removed below it, all classes, courses, and users anywhere on the system that reference this content are automatically updated to reflect the changes.

Open Architecture vs. Defined Implementation

When implementing a Learning Objects-based LCMS, it is important to begin with a *framework* which is flexible enough to grow and evolve with your needs, that can support your own *implementation* of a Learning Objects strategy and avoid the pitfall of selecting a system that enforces its own inflexible Learning Objects implementation on you and your organization. The following table illustrates the difference between the two approaches:

Open Architecture

- Framework to manage a LO implementation (e.g. TopClass)
- Flexibility to modify/customize
- Agnostic (Authoring tools , Content vendors , Emerging standards)

Defined Implementation

- Domain specific (e.g. designed for one company or purpose)
- Defined (Taxonomy, Granularity, ID Models, Visual Styles)

Not Just Another e-Business

Learning is different than most other e-business areas. It is not driven purely by data or process, but is very experiential and the experience and effectiveness of learning and what works and what doesn't, varies considerably from person to person, based on their preferred learning styles and their history and experience. From the point of view of the learning organization the lifetime of the "learning transaction" is significantly longer than it is in areas such as e-procurement where once the purchase is made and fulfilled the transaction is over. In learning, the transaction is really only beginning at that point.

Conclusions – It's All About Speed, Choice, & Scale

Speed

To cope with the shorter business cycles of today, it is increasingly important to compress the learning lifecycles by capturing, delivering, managing, and measuring knowledge and learning across the extended enterprise.

Choice

Choice is a key element of an e-learning strategy, particularly as it relates to improving time to performance. Most fundamentally this means choice in terms of content, from being able to select and use content at a very granular level to allowing users to select a delivery mode (such as pure text, audio only, or audio and video) to the type and level of interactivity (such as simulation stand-alone or simulation with subject matter feedback interaction). Ultimately this translates to just-in-time, just-enough learning at the point of need.

Scale

Once an organization moves beyond initial tactical or pilot projects, the LCMS must be capable of supporting massive scale in terms of content and users. This translates not simply to raw performance, but also the ability of the tools and processes to cope with large-scale deployment. WBT Systems has many customers delivering thousands of courses per week to tens of thousands of users in multiple countries and languages from a Learning Objects library of millions of objects.

It is clear that the key to leveraging the existing knowledge assets in an organization, and making them available in the fastest most efficient way possible, is the e-Learning Content Management System. Whether deployed in a stand-alone fashion or as part of a "best-of-breed" integrated solution, every successful e-learning solution requires an LCMS. With its industry leading TopClass family of products, WBT Systems is truly "Powering the e-Learning Revolution".



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