

e-Learning Application

Executive Summary

The coming year will see the creation of educational technologies by those few people who understands both computer science and education. Instead of reading and learning, students will be doing. They will run the economy, run political campaign, run businesses, investigate cures for disease, practice being a doctor, and go back in time to remake historic decisions."
~ Roger C. Shank, CACM - March 2001.

"Most elearning companies really offer training management, not knowledge management. There is a big difference." ~ Verna Alle, LiNE Zine - Fall 2000.

"An Instructional Knowledge Server on the web could have such a support functionality... . In order to reach this goal, a first step is to extract an ontology from existing Instructional Theories and from Instructional Design Model"
~ Bourdeau and Mizoguchi; AIED'99.

"Work is still going on in ontologies.. . it is difficult... . and no finished product has been produced."

".... operationalisation of multiple theories... with very different sets of frames of reference, let alone the whole domain of pedagogy, is impractical."
~ from the ITS-ONTOLOGY mailing list.

What is eLearning?

eLearning is the creation, enabling, delivery and/or facilitation of lifelong learning by leveraging various Internet and Web technologies. eLearning is an outgrowth of a number of far-reaching societal and technological changes that have been evolving over the last several years including the following:

- Our economy has become knowledge-based.
- Changing demographics have heightened the demand for learning services.
- Political winds are blowing toward the need for a stronger focus on learning.
- The rapid growth and ubiquity of the Web have morphed it into a powerful learning platform. Worldwide, 350 million Web users are expected by 2003.

eLearning enables the delivery of interactive learning to anyone, anywhere, at any time, and across any platform. Most importantly, eLearning requires only a fraction of the resources associated with traditional training methods.

The excitement over eLearning cuts across the higher education, government, and the private sector. Educational institutions are using eLearning to support distance education as well as to support the shift in educational methods from teacher-centred to student-centred paradigm. Government departments have taken to eLearning with a great deal of enthusiasm in order to minimise training costs in the increasingly complex administrative environment with a geographically distributed workforce

LearnITy©: an eLearning Solution for the Knowledge based economy

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What is LearnITy©?

LearnITy is an advanced eLearning solution. The development of LearnITy is based on a unique synthesis of ideas taken from research and practice. Research ideas have been drawn from fields of ID (instructional design) , learning theories, ITS (intelligent tutoring systems), knowledge management and adaptive multimedia. The current practices of the eLearning industry such as standard compliance (SCORM, IEEE LTSA, etc.) and web-based technical architecture (XML, Java) have been adopted right from the beginning.

Who is LearnITy© for?

LearnITy is meant for three types of customers:

- **Corporates and Government entities** - will use LearnITy to quickly implement an eLearning/knowledge management program for its geographically dispersed employees, suppliers, and customers.
- **Institutions of learning** (universities, institutes, and other educational bodies) – will use LearnITy to initiate on-line learning for the students complementing their traditional instructor-led programs.
- **Learning service providers** (LSPs) – will use LearnITy as the engine that will drive their educational portals that cater to home and individual customers.

What is unique about LearnITy©?

LearnITy has some unique attributes that makes it an eLearning solution of choice:

- LearnITy has a much lower cost of ownership compared to other products. A server based pricing is used that does not lead to higher costs as more users are added. Also the software environment used by LearnITy does **not** require the usage of high cost software components (high end database servers, application servers, workflow engines, content management systems, etc.). In fact LearnITy, having been built on open standards such as Java, XML, and SQL, enable the customers to protect their existing investments in IT by virtue of the product being able to inter-operate with solutions provided by other standard conformant vendors as well as utilise software provided by the open source community.
- LearnITy is built in a manner that enables the separation of content from instructional strategy. LearnITy is not biased towards any particular learning theory or instructional strategy. Instead of hard-coding any particular strategy or implementing any particular theory in the source code, the unique feature of externalization of the instructional strategies in XML notation enables the system to support an infinite variety of

instructional strategies. Thus the same content may be delivered using different strategies based on student model or other conditions. This externalisation of instructional strategy allows users to quickly implement their strategies of choice and provide their learners with customised learning experiences.

- Most organisations have a rich collection of content in various areas such as Sales Training, Management Training, etc., in various formats such as Microsoft Word files, Powerpoint presentations, etc. LearnITy makes it possible to make use of any existing source of content (as long as the content may be viewed within a browser with the help of suitable 'plugins'). Also, since LearnITy conforms with the SCORM standard for eLearning content, a rich collection of 3rd party content is immediately made available to customers of LearnITy.
- LearnITy has been developed to work on any platform that supports Java. Since almost all platforms today support Java this means that LearnITy can run on a number of platforms. Also the standard driven nature of LearnITy helps since the standards (say SQL) are likely to be supported across platforms rather than particular products (say a particular content management system).
- The above features (content reusability, standard conformance, & platform issues) makes LearnITy a solution that is very easy to implement. Additionally the feature of externalisation of instructional strategy allows customers to quickly implement their strategies of choice and provide their learners with customised learning experiences. We also plan on providing pre-packaged bundles of instructional strategies (categorised by "vertical" subject areas) based on ontologies of instructional design to enable quick implementation of eLearning projects using LearnITy.

The LearnITy Portfolio

The LearnITy© solution comprises of three components:

- **The LearnITy©Engine** – This is the core product that delivers content to the learners based on their learning objectives and learning preferences. The engine accesses learning content, course structure information, course meta information, learning strategy information, and learner records in order to provide the learners with the learning experiences that is appropriate to his/her learning style and learning strategy. The Engine works with any type of content that may be displayed in a Web Browser (with a plug-in if necessary), e.g., MS Word, MS Powerpoint, PDF, HTML, Flash, etc. (more on this in the LearnITy Process section).
- **The LearnITy©Administrator** – This product provides an Web-based interface for administering various elements of the solution:
 - managing learner profiles and generating various reports about the learning activities undertaken by the learners
 - providing content management services for the LearnITy© Repository that stores learning content, course structures, course meta information, and learning strategies
 - setting various parameters of the LearnITy© engine so as to customise the engine operation according to the needs of the customer
- **The LearnITy© Course Designer** – This product provides a GUI to create and maintain course structures, course meta information, and learning strategies. All these three entities are generated in the form of XML files. The Designer is made available in the form of a stand alone Java application that can be run on a PC. This product is used in

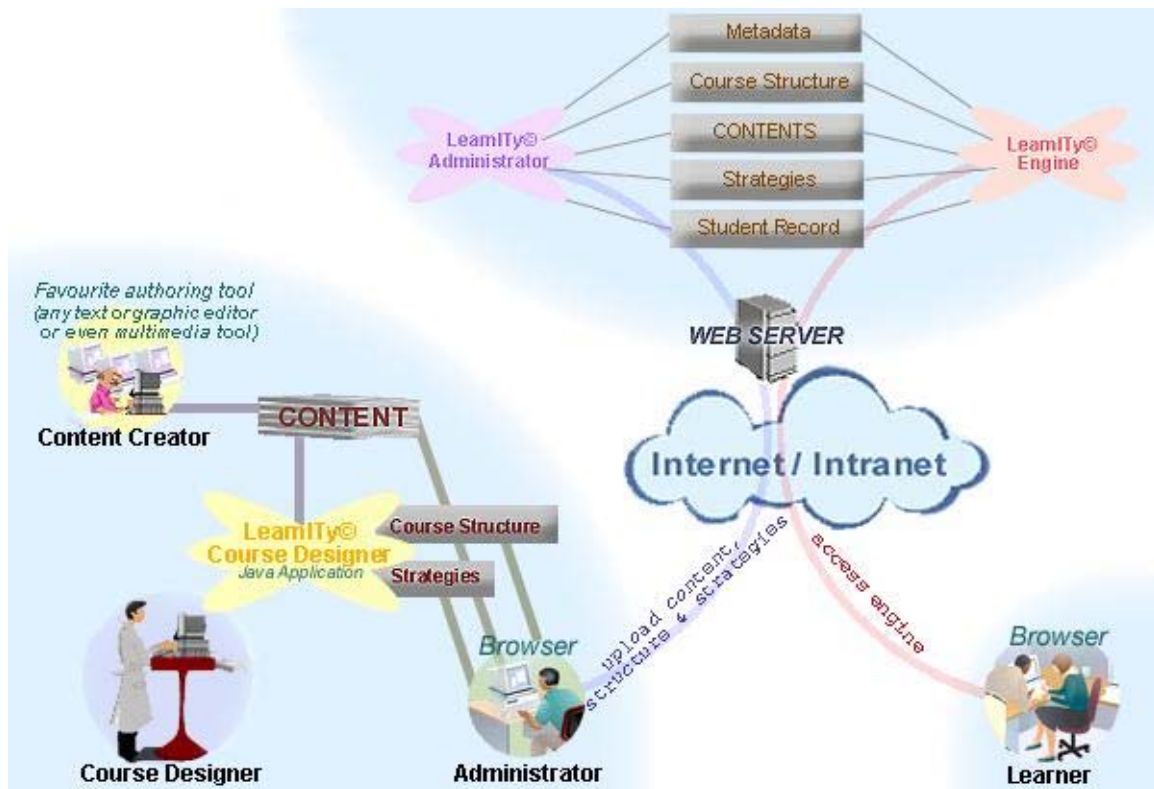
an off-line mode (without requiring an on-line connection with the LearnITy servers) and the various outputs produced by the tool are later up-loaded to the LearnITy© Repository using the LearnITy Administrator. However, the Course Designer is also available from within the Administrator so as to enable on-line maintenance of the various entities (e.g., changing a learning strategy file, replacing a course structure file, etc.).

Please note that the Course Designer is NOT an Authoring Tool! The content authors are expected to use their favourite authoring tools to produce the content. The course structure information provides a mapping of the different elements of course (e.g., topic, lesson, etc.) to different content objects.

How does LearnITy© Work?

Course designers define course structures and appropriate learning strategies for the target learners using the LearnITy Course Designer product. The content material for the courses are created by content creators using appropriate tools (e.g., Authorware for multimedia content) and these content objects are associated with the topics/lessons of the course in the course structures that are defined. Once the course content, course structure and learning strategies are created these files are uploaded by the course administrator to the LearnITy repository using the LearnITy Administrator product. After uploading of the files the course administrator makes the course operational (i.e., available to the learners) by configuring the LearnITy engine. From this point onwards the course may be accessed by the learners from their browsers.

The overall scenario of how LearnITy works is given below:



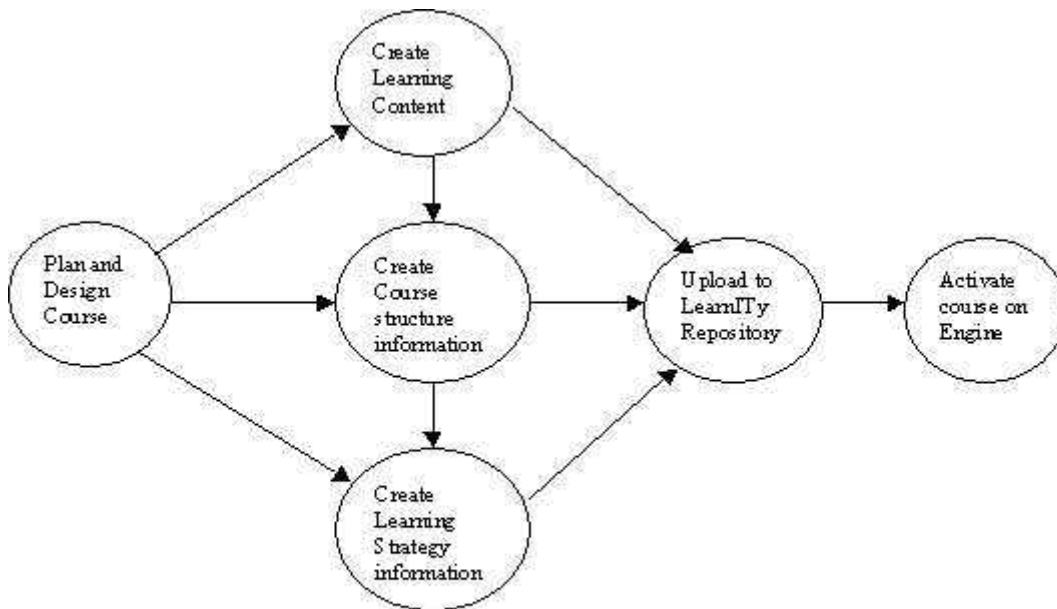
LearnITy may be deployed on the customers intranet or it may be deployed on the publicly accesible internet. In the first case the LearnITy server products and the repository would have to be installed on a powerful server machine on the intranet. In the second case services of an Internet Service Provider (ISP) may have to be used to host the LearnITy products and the repository.

The LearnITy engine has various modules that interact amongst themselves to provide learners with their learning experiences. The main modules of the engine and functionalities are as follows:

- Learning Material Agent – This module is responsible for handling all interactions with course contents. Based on the student requirements it fetches the appropriate content and send it to the Delivery agent.
- Student Model Agent – This module is responsible for managing all information about the student. This includes static information (such as learning style and preferences) as well as dynamic information (how much of the material the learner has consulted and his/her mastery level of the various topics).
- Coach – This module manages the learning process. It consults with the other modules to get the necessary information (e.g., learning strategy file for the course being studied, the learner's style and other preferences, the learner's record of the state of his/her knowledge of the course till date) and guides the student through the course.
- Delivery Agent – This module provides the user interface for the system and manages all interaction with the student.
- Evaluation Agent – This module is responsible for evaluating student performance (both formative and summative evaluations) and providing feedback to the coach.

The steps required to be followed by an organisation to implement the LearnITy solution is given below.

Implementing a LearnITy based Solution



The whole essence of the LearnITy solution is simplicity and an incremental approach to attain the goal of providing learners with customised learning experiences. Implementing an eLearning program using LearnITy is thus a very simple and incremental approach. The LearnITy process is pictorially depicted below and each of the steps are explained in detail.

1. **Plan and Design Course** – The LearnITy solution is not biased towards any particular theory of learning or instructional design method. You are free to employ your method of choice and design the course. The result of the course design should at the least result in a topic map (hierarchical list of lessons/topics and description of content objects associated with each lesson/topic).
2. **Create Course Content** – Based on the design of the course you will have to create or collect the appropriate course content objects. LearnITy provides you with the freedom of using any type of course content as long as the content is viewable in a Web Browser such as Netscape or Explorer (using a special plugin if necessary). Thus Microsoft Word documents, Powerpoint presentations, PDF files, HTML files, Flash animations, Real Video movies, MPEG audio files, web enabled Authorware files, etc. , are all acceptable content objects. Please note that you will have to use authoring tools to create the course contents and these authoring tools are not a part of the LearnITy solution. LearnITy also gives you the flexibility of using existing websites as content objects (in this case please ensure that you take care of copyright and other intellectual property related issues). Since LearnITy is conformant with the international SCORM standard for content, it is possible to source content from a large number of 3rd party content vendors and use them with the LearnITy solution.
3. **Create Course Structure Information** – Information about the structure of the course (the hierarchical lesson plan) and information about the content objects associated with each lesson/topic should be entered using the LearnITy Course Designer product. The product will generate a Course Structure File (CSF) in XML notation. This CSF is generated according to the SCORM standard which is an international standard for courseware interoperability (see the Standards section). The SCORM standard allows course structures of arbitrary nesting levels so that any type of curricular hierarchy may

- be implemented (e.g., course – lesson – topic, module – unit – lesson – learning step, etc.). The Course Designer is also used to enter meta information about the course for which a separate XML file is generated based on the SCORM metadata standard. This metadata records different types of information about the course as a whole.
4. **Create Learning Strategy Information** – Information about learning strategy records how the content should be delivered to the learners based upon different parameters such as their learning styles and strategies. The LearnITy Course Designer is used to enter this information and the product generates an XML file called the strategy file. This file is generated for each course.
 5. **Upload to LearnITy Repository** – The LearnITy Administrator product is used to upload content objects, course structure files, course meta information files, and learning strategy files to the LearnITy Repository that is hosted in a server machine.
 6. **Activate the course** – Once the various files associated with a course are uploaded, the course is activated, i.e., made available to the learners, by configuring the LearnITy engine using the LearnITy Administrator product. From this point onwards the course may be accessed by the learners from their browsers.

LearnITy Technical Overview

- **Architecture** - LearnITy© is built using a modular architecture that is based on the IEEE LTSA ((Learning Technology Standard Architecture) (<http://ltsc.ieee.org>) .
- **Content** - LearnITy© has been designed to work with any SCORM compliant content. SCORM (Sharable Content Object Reference Model) is an initiative of the Advanced Distributed Learning organisation (<http://www.adl.org>) that has developed a specification for courseware interoperability. This standard brings together the work of AICC on interoperability and of the IMS Global Learning Consortium, Inc. (IMS) on various issues including reusability and packaging of web-based eLearning content.
- **Student Model** - LearnITy© uses the "overlay model" to store information about the knowledge gained by a student. This model is dynamically updated as the student interacts with LearnITy© and obtains mastery over new topics. LearnITy© uses Bloom's taxonomy for representing mastery information for any topic.
- **Technical Options** - LearnITy© has been developed using the following technologies and products:
 - HTML with Javascript in the browser
 - Web Server supporting Servlets (tested with Jakarta Tomcat and Sun's Java Web server)
 - Java Servlets at the backend
 - XML for the defining course structure (following the SCORM DTD) and learning strategies
 - RDBMS with support for storing XML as BLOBs (tested with Oracle 8i and mySQL)
 - JDBC for connectivity to database
 - Java libraries for parsing XML and DOM (tested with Oracle Java libraries)

LearnITy has been tested to run on Linux and Windows platforms.