

Developing E-Learning System

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Abstract: *In this paper we present a different elements regarding the requirements of an e-learning system, the users and their roles from the point of view the object oriented analyses and design methodologies and the Use Case Diagrams for such a system.*

Key words: *E-learning system, User roles, Object Oriented Analyses*

CHARACTERISTICS OF E-LEARNING SOFTWARE PRODUCT

Flexibility

- An improved process control for approving course creation, attendance and other activities provides multiple levels of permission and better accountability.
- Allow users to access content from their own site, while saving bandwidth and improving access quality.
- Interoperability with other software offers greater flexibility in utilizing authoring tools for creating powerful training content.
- Flexible definition of user roles - enhances management flexibility by allowing a single user to possess multiple roles. New roles can be created and customized with new names and different privileges.
- Online and Offline classroom/course management – must include a management mechanism for both online and offline courses. Classroom course management functions include: attendance management, leave application management, and external training applications.

Comprehensiveness

- The functions of the learning system must be fully integrated, offering a total solution that can be utilized by multiple types of users.
- Reporting functions, different types and formats of reports, deliver more detailed information.
- Conformance with international e-learning standards.

Ease of use

- Expanded definitions of user roles allow easier system navigation by disabling functions according to pre-defined privileges.
- An intuitive interface simplifies content development and gives trainers a quick-and-easy method for generating test questions and monitoring performance. The features a user interfaces that's easy to understand and gives administrators the means to manage users via the web. A tree based course interface, personal learning calendar and other personalized functions swiftly guide learners through the process of arranging learning schedules. Content creators can build course materials quickly and easily via step-by-step instructions.
 - Personalized settings empower learners to handle enrollment procedures, participate in training, and keep track of their progress hassle-free.
 - Enhanced learning through interactive forums - facilitating fluent communication within an organization's learning community, the system lets learners participate in real-time chat rooms or structured offline discussion groups. These formats enhance the learning process by providing participants with flexible formats for sharing ideas and experience. The system further strengthens the effectiveness of the learning community by providing an automatic email notification system for sending course information to specific training groups or periodically reminding learners to complete essential courses.
 - Easy-to-create multimedia questions - tests can be inserted into courses to evaluate learning results. A trainer can design a question bank and presentation format to include simple text-based multiple-choice questions as well as multimedia-based

questions to fulfill different testing requirements. Question bank provides random question selection and testing time control functions. Tests are automatically graded immediately after the test is taken, with the learner and instructor being notified of the results.

THE REQUIREMENTS OF AN E-LEARNING SOFTWARE PRODUCT

Learning Community Participation

- Every course and class includes real time chat room and structured offline forums, providing interactive learning through shared ideas and discussions.
- Administrator can also create public and learning community related discussion forums

Record Tracking

- Records course learning time for learners including total learning time, single course learning time, single course chapter learning time and testing time
- Records learning progress for learners including learning summary for all courses and learning progress for a single course
- Learner can inspect own learning record and test results while managers and instructors can also query a learner's learning records and results

Course Creation

- Support the importing and exporting of contents that adhere to such e-Learning standards
- Intuitive creation process allows the content designer to easily create course materials through a web interface by following system instructions
- Support multiple file formats like MS Office, HTML, Images, Adobe PDF, Video and Audio, and Macromedia Flash
- Course contents can be published anytime for learners to view, or hidden for future usage. Such contents may also be shared with other instructional designers

Course Management

- Instructor can create and manage online courses, or provide support in the management of classroom courses
- Instructor can set class times, eligible learner lists and maximum enrollment numbers for a course
- Class management mechanism allows for creation of multiple classes within a course and management of learners belonging to different classes
- Intelligent approval system that will automatically check learner id's and complete enrollments when learners enroll in a course. Relevant managers will be automatically notified if manager approval is required
- Provide a waitlist function. When the maximum enrollment number of a course has been reached, the system can place learners who wish to enroll in the course on a waitlist. If any of the enrolled learners withdraw from the course, the learner on the waitlist will automatically be enrolled in the course
- The pre - requisite course function. This function may require learners to first complete courses that were set as pre-requisites of other courses before being allowed to enroll in such a course
- Classroom course management functions include leave application, attendance management, results management and external training management to assist enterprises in integrating classroom and online training systems
- Classroom courses can be integrated with online testing mechanisms to create a blended learning structure

Curriculum Management

- Instructor can create curriculum online which may include any number of courses
- Instructor can set eligible learner list and maximum enrollment numbers for a curriculum

- Intelligent approval system that automatically checks learner ids and completes the enrollment when learners enroll in a course. Relevant managers will be automatically notified if manager approval is required for enrollment in such curriculum
- Provide a waitlist function. When the maximum number of enrollments is reached the system can place extra learners who wish to enroll on the waitlist. If any of the enrolled learners withdraw from the course a learner on the waitlist will automatically be enrolled
- A pre-requisite curriculum function. This function may require learners to first complete subjects that are set as pre-requisites to relevant curricula before allowing them to enroll in others

Results Evaluation

- An instructor may design tests or surveys according to requirements
- Provides a question bank function. Instructors may create any number of question banks, which can then include questions of different difficulty levels. Tests can be created based on settings such as the question difficulty level. Fixed or random question selections are allowed. Question types include: Yes/No; multiple choice; and written answer questions. Pictures and multimedia files can also be inserted into the question to enrich the question contents
- Includes comprehensive testing functions. An instructor may add multiple tests to a course. The test contents may be automatically adjusted according to different difficulty levels. The testing time and maximum re-test attempts can also be set Yes/No and multiple choice questions can be automatically graded by the system while written answer questions can be graded online by instructors who are notified by email
- Question bank can be repeatedly utilized by different courses and shared between instructors

Reports

- Generates reports according to learning record or result evaluation
- Users may customize unique training analysis reports by extracting data from the database
- A user can design reports according to unique requirements to provide better visual analysis of learning results

Email Notification

- System can automatically send email notifications to users when course publication, course expiration, course approval, test results and other events occur

To develop an e-learning system is need to model learning processes to support the effective learner of appropriate learning objects. Each process should be analyzed in detail and modeled using a modeling language such as UML (The Unified Modeling Language). Following UML closely, e-learning processes can be developed in 5 phases as illustrated in figure 1. In each phase, models with different artifacts are produced.

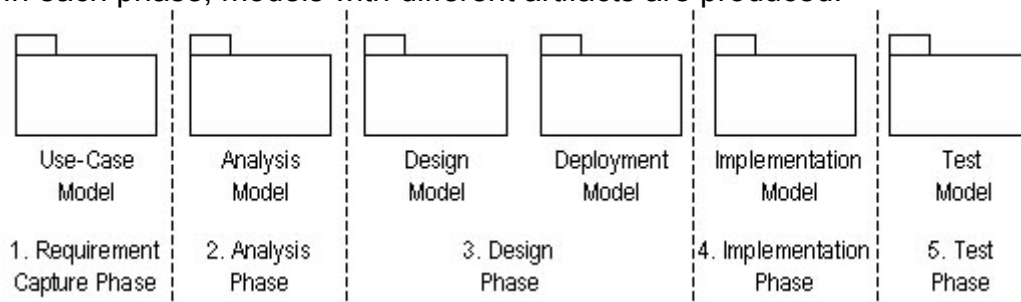


Figure 1. The phases of development e-training processes

All these models are related and represent the e-learning system as a whole. Elements in one model have trace dependencies backwards and forwards with the help of links to other models. The final representation of all the models would be the architecture of the entire system.

Below we will illustrate requirement capture phase. The first step for this is to identify the users of the system and their roles. The users are: Learner, Course manager, Content creator, Team manager and System manager

USER ROLES

The system includes more privileges allowing access to specific areas of system functionality. Each form of access is grouped into categories according to the user type. Users may assume two or more roles

Learner who set goals and plan the learning, enroll a course, interact with the contents and tools, and perform the activities proposed, communicate with tutors, coordinators and other learners, evaluate his progress, work with other learners, specify his preferences, modify or cancel an enrollment

User type: Learning

User roles: Learner

User activity: Takes part in training courses

Activity functions: Enrollment, View courses, Personal progress, Interactive discussions, Adjust user-interface

Author who create and update contents

User type: Content Creation

User roles: Instructional designer, Coeditor, Publisher

User activity: Develops training content

Activity functions: Content creation, Content utilization, Content updating and collaboration

Coordinator who suggest and supervise the learning plan, validate contents, tools and activities, supervise tutors and coordinators work, view navigation and progress reports, reassign tutors and sub-coordinators

User type: Course Management

User roles: Instructor, Coordinator, Learning administrator

User activity: Creates courses and manages progress

Activity functions: Create new course, Content category management, Create curriculum, Inspect learner activities

Tutor who stimulate learning proposing activities, create work teams, provide contents, evaluate learners progress, communicate with learners, other teachers and coordinators

User type: Team Manager

User roles: Manager, Team administrator

User activity: Monitors learning progress and evaluates results

Activity functions: Inspect course progress, Monitor learner progress, Tally and analyze test results, Approve eligible course enrollments

Manager who validates and manages enrollments, manage courses catalogue, assign profiles and privileges to the users, administer the system

User type: System Management

User roles: System administrator

User activity: Modifies user privilege settings

Activity functions: User privileges management, System settings management, Backup database

The general Use Case Diagram and the Use Case Diagrams detailed for the each user are illustrated in figure 2 and figure 3:

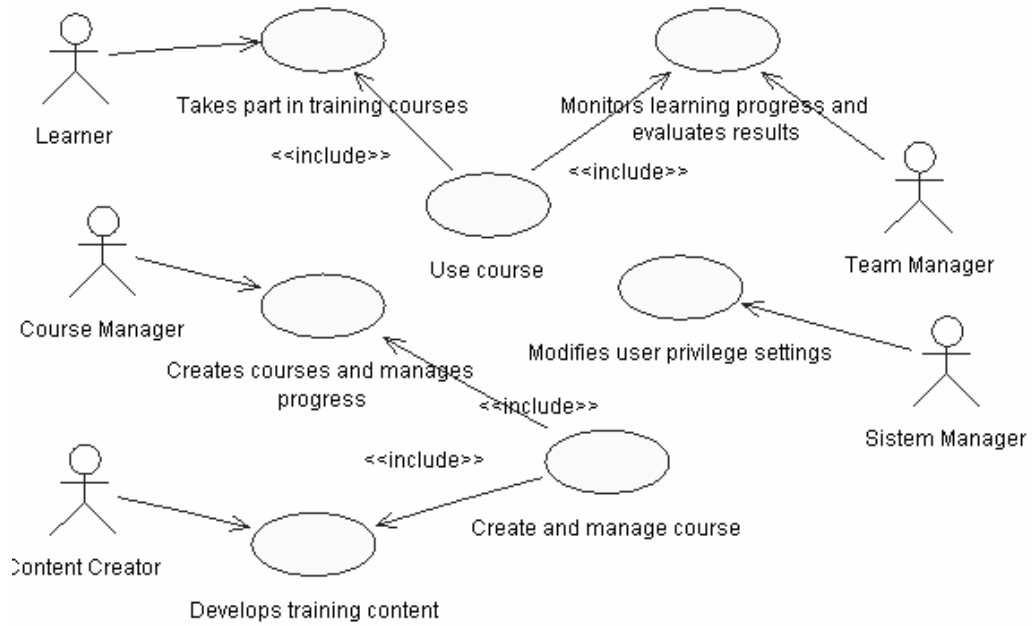


Figure 2. General Use Case Diagram



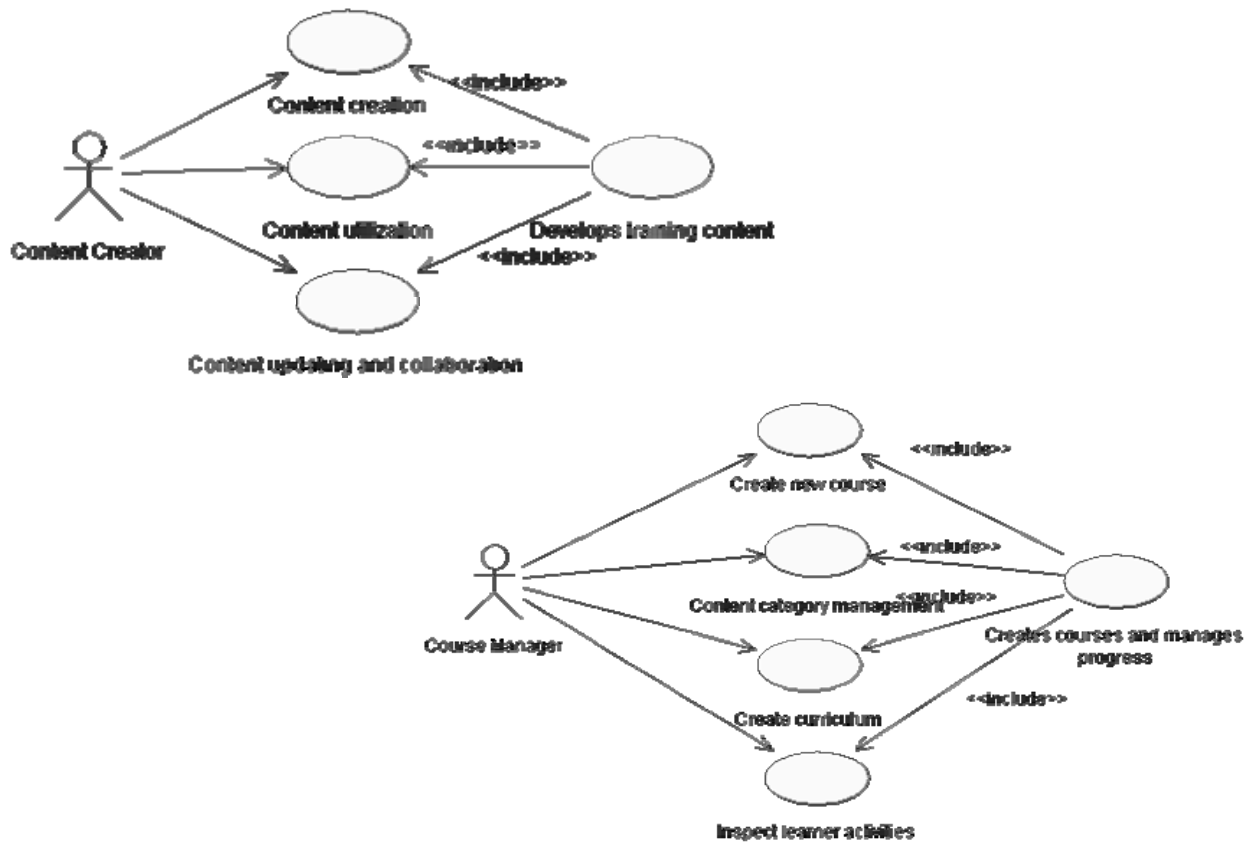


Figure 3. Use Case Diagrams detailed for the each user

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