Educational Technology

Learning Management Systems

(L.M.S.)

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Learning Management Systems (LMS) - Contents

- Terminology, descriptions, definitions
- Education – corporate LMS
- Features – tools - advantages / benefits
- Interoperability Standards
- Selecting an LMS
- LMS marketplace

Unless otherwise noted, most material is taken from:
- *Learning Management Systems, Don McIntosh, form the book: "Education for a Digital World", S. Hirtz, 2008*
- *Learning Management Systems: A Review, Bennett S., AUT University, 2011*

LMS – What?

- Initially, such systems were the basic tools for delivering eLearning in university context, incrementing conventional education and providing blended and fully online courses.

- By 2010 almost all universities had one or more LMS installations (proprietary or open source)

- Before the advent of LMS, eLearning was implemented through a various web-based tools such as:

  - *plain wed-pages,*

  - *content management systems (CMS),*

  - *Various communication tools (e-mail, bulletin boards, mailing list etc.) or*

  - *combination of the above.*

- Nowadays, LMS is an enterprise solution almost for every educational organization, along with the technical support and helpdesk.

LMS - description

- LMSs resemble other web-based Information Systems designed for various applications (e-commerce, HR, CRM, student records etc.), but what makes an LMS <u>unique</u> is its <u>functionality</u> and <u>instructional nature</u>.

- In "Field Guide to Learning Management Systems"[*] Ellis describes LMS as a <u>software application</u> that automates the <u>administration</u>, <u>tracking</u>, and <u>reporting</u> of training events.

- According to Ellis a "robust" LMS can:

  - *Centralize and automate administration.*

  - *Use self-service and self-guided services.*

  - *Assemble and deliver learning content rapidly.*

  - *Consolidate training initiatives on a scalable web-based platform.*

  - *Support portability and standards.*

  - *Personalize content and enable knowledge re-use.*

Core capabilities of current LMS

According to Dr. Terry Anderson, any LMS must support four core activities:

- Content delivery

  - *LMS provide a storage place in each course for distributing educational material and media.*

- Assessment.

  - *Easy test and assignment generation for measuring student learning. Tools for importing/exporting/sharing tests/questions/quizzes*

- Interaction and Communication

  - *Synchronous and asynchronous communications tools for both teachers and students (threaded text discussion tools, chatting, web conferencing with breakout rooms)*

- Analytics

  - *Tools for allowing instructors to monitor and track learning activities*

Definitions through standard bodies

- A <u>software package</u> used to <u>administer</u> one or more <u>courses</u> to one or more learners. An LMS is typically a <u>web-based</u> system that allows learners to authenticate themselves, register for courses, complete courses and take assessments (**ADL**).

- An LMS is a <u>software application</u> usually <u>web-based</u> used to plan, implement, and assess a specific <u>learning or training process</u> (**AICC**).

- A <u>computer application</u> that enables the assignment of <u>content</u> to learners, learning, and the <u>reporting of learning outcomes</u>. This is used interchangeably with Course Management System, Managed Learning Environment and a host of other terms (**IMS**).

- <u>Software system</u> designed for the purpose of performing administrative and technical support processes associated with <u>e-learning</u> (**ISO**).

- A <u>computer system</u> that may include the capabilities to register learners, schedule <u>learning resources</u>, control and <u>guide the learning process</u>, analyze and report learner performance, and schedule and track learners (**IEEE**).

1ˢᵗ Flash Activity

Από την εμπειρία σας, αλλά και από όσα αναφέρθηκαν σύντομα ως εδώ, έχετε κάποια μια καλή εικόνα για τον όρο LMS.

Τι είναι για εσάς τα παρακάτω:

- **Classroom management,**
- **Course management,**
- **Curriculum management,**
- **Learning management,**
- **Community management**

Description as 5 level hierarchy of increasing capabilities[*]

- **1st level**
  - *Classroom management*

- **2nd level**
  - *Course management*

- **3rd level**
  - *Curriculum management*

- **4th level**
  - *Learning management*

- **5th level**
  - *Community management*

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Description as 5 level hierarchy of increasing capabilities(*)

- ■ *1ˢᵗ level*

  - ● **Classroom management**

- ■ *2ⁿᵈ le...*

  - ● *Co...*

- ■ *3ʳᵈ le...*

  - ● *Cu...*

- ■ *4ᵗʰ level*

  - ● *Learning management*

- ■ *5ᵗʰ level*

  - ● *Community management*

Facilitates delivery of educational resources or other learning aids for a particular lecture (a website to distribute materials).

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(*)*Learning Management Systems: A Review, Bennett S., AUT University, 2011*

Description as 5 level hierarchy of increasing capabilities[(*)]

- *1st level*
  - *Classroom management*

- *2nd level*
  - ***Course management***

- *3rd level*
  - *Cu...*

- *4th level*
  - *Lea...*

- *5th level*
  - *Community management*

Supports multiple class sessions across an entire course with common goals, adding tools for evaluation, feedback and discussion.

(*)Learning Management Systems: A Review, Bennett S., AUT University, 2011

Description as 5 level hierarchy of increasing capabilities[(*)]

- **1st level**
  - *Classroom management*

- **2nd level**
  - *Course management*

- **3rd level**
  - ***Curriculum management***

- **4th**
  -

- **5th**
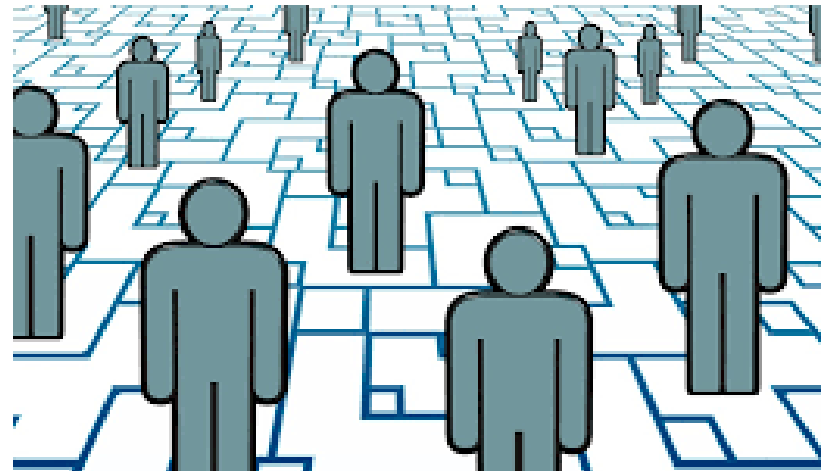 -

Provides meta-tools to handle relationships among a set of courses (for indexing a curriculum across a programme or identify common attributes across courses).

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Description as 5 level hierarchy of increasing capabilities[(*)]

- *1st level*

Information is organized around the learner. This facilitates self-directed learning as students can choose from a variety of learning opportunities and can progress at different rates over time depending on individual goals. Students may have a private area within the system to assemble selected resources (e-portfolio).

- **Learning management**

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- *5th level*

- *Community management*

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Description as 5 level hierarchy of increasing capabilities[*]

- **1st level**

  - *Classroom management*

- **2nd level**

  - *Course management*

- **3rd level**
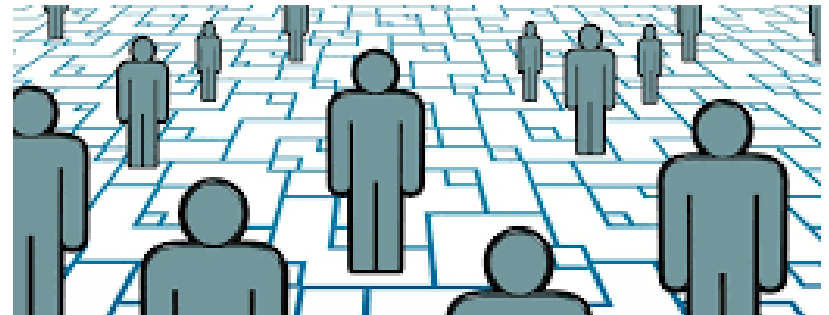
  - *C...*

- **4th l...**

  - *L...*

- **5th l...**

  - ***Community management***

Enables borders to extend beyond the class, course, curriculum or the traditional campus learner, allowing for multiple learning contexts and organizations (user portal, myUniversity, myCampus)

[*]Learning Management Systems: A Review, Bennett S., AUT University, 2011

Description as 5 level hierarchy of increasing capabilities[(*)]

- *Classroom management* – facilitates delivery of notes or other learning aids for a particular lecture (a website to distribute materials).

- *Course management* – supports <u>multiple class sessions across</u> an <u>entire course</u> with common goals, adding tools for <u>evaluation</u>, <u>feedback</u> and <u>discussion</u>.

- *Curriculum management* – provides meta-tools to handle <u>relationships</u> <u>among</u> <u>a set of courses</u> (for indexing a curriculum across a programme or identify common attributes across courses).

- *Learning management* – information is organized <u>around the learner</u>. This facilitates <u>self-directed learning</u> as students can choose from a variety of learning opportunities and can progress at <u>different rates over time</u> depending on <u>individual goals</u>. Students may have a private area within the system to assemble selected resources (<u>e-portfolio</u>).

- *Community management* – enables <u>borders to extend beyond</u> the <u>class,</u> <u>course, curriculum</u> or the traditional campus learner, allowing for multiple learning contexts and organizations (user portal, myUniversity, myCampus)

LMS capabilities [*]

- ■ *Blended learning support*

  - • *by offering curricula that can mix classroom and virtual courses easily and enable personalized training.*

- ■ *Content integration*

  - • *by supporting natively, a wide range of third-party courseware.*

- ■ *Administration tools*

  - • *manage user registrations and profiles, define roles, set curricula, assign tutors, author courses, manage content, build schedules for learners, instructors and classrooms. Also, administer internal budgets, payments, and chargebacks (commercial systems).*

LMS capabilities [*]

- **Assessment capabilities**

  - *for testing and evaluation.*

- **Integration with HR systems**

  - *training tailored to learner's role.*

- **Adherence to standards**

  - *import and manage courseware that complies with standards regardless of the authoring system that produced it.*

- **Skills management**

  - *enables measuring training needs and identify improvements based on workers' collective competence in specified areas.*

en.wikipedia.org

[*] LMS and LCMS: What's the Difference?, Greenberg L., Learning Circuits, 2002

Education - Corporate LMSs

- <u>Education LMS</u>.

  - *Primarily for the delivery of <u>instructor's</u> designed eLearning. With <u>course content creation</u> capability. Possible tools for <u>content managing</u>.*

- <u>Corporate LMS</u>.

  - *Provide features to help <u>manage classroom </u>instruction. The eLearning is often assumed to be primarily <u>asynchronous, self-directed </u>courses (many of these are <u>purchased</u> from off-the-shelf courseware vendors).*

- <u>Communication</u> with other systems.

  - *<u>Education LMSs</u> must be able to accept data from and send data to the <u>registrations system</u>. <u>Corporate LMSs </u>must be able to communicate with the <u>human resources</u> information system.*

  > Main distinguishing feature:
  >
  > most business LMSs provide complete registration systems for classroom instruction, as well as eLearning.

LMS and formal education (why)

- In formal education, LMS are used to deliver online courses and augment on-campus courses (supporting traditional face-to-face courses though).

- Initially, used in <u>colleges and universities</u> to <u>support distance education</u> programs by providing an alternative delivery system.

- <u>Now,</u> they are used as platforms to plan, implement, facilitate, assess, and monitor student learning by providing:

  - *<u>Online resources</u> to <u>supplement</u> regular (face-to-face) course material .*

  - *Opportunities for <u>blended learning</u>.*

  - *Fully online e-courses for students who require <u>additional flexibility</u> (not physically present or are not attending on full time basis. This also benefits students who are <u>disabled</u> or ill and <u>unable to attend </u>regular classes).*

- Competitive pressure between universities (it has become a symbol of the higher learning status quo).

LMS and formal education (how)

- Institutions
  - *Through LMS, institutions maintain the integrity of their curricula and enables faculty to develop courses, facilitate communication, and assess students.*

- Instructors usually create online e-courses to:
  - *upload the necessary educational material for the students, design learning activities (according to educational plans) and set up collaborative tools (mail, chatting, blogs, wiki, bulletin boards etc.).*

- Students
  - *access the course materials, through the net,*
  - *do both individual and collaborative assignments and*
  - *participate to learning activities (supported by the LMS).*

blog.creativecommons.org

- Usually, instructors provide the content.
  - *But it is also possible to use instructional material from other sources (other institutions, repositories), especially when wide-accepted reusability standards compliance exists.*

Education LMS – tools / features

Through course/module development tools <u>an instructor</u> can:

- *<u>Provide</u> and <u>organize resources</u> related to the <u>learning objectives</u> (course syllabus, uploading material created by authoring tools, indexing tools etc.).*

- *Facilitate and manage <u>online interactivity</u> related to the learning objectives, learner interaction with the content and <u>communication</u> between learners, instructors.*

- *Develop content (author, manage, store and distribute) -interactive or not.*

- *Assess <u>students' performance</u> with test and <u>assessment tools</u> (quizzes, assignments, submission, grading).*

- *Assess <u>teaching effectiveness</u> by tracking student activity with survey and administrative tools:*
  - *collect the results of learner performance (tracking of learners' data from activities, including progress on a predefined set of training goals or requirements).*
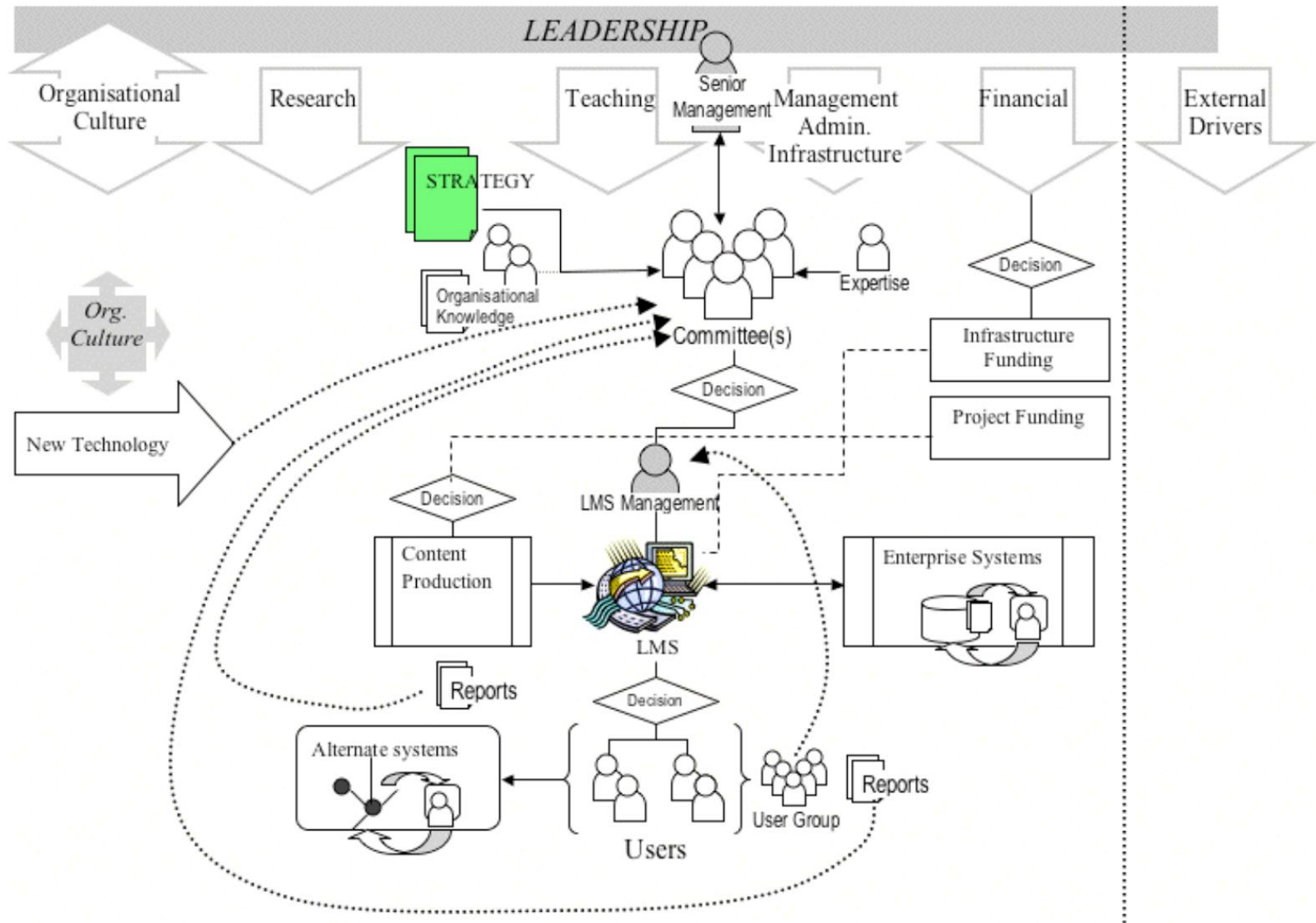
Education LMS – more tools / features

- Tools for students

  - *course enrolment, personalized environment, bookmarking, access to content, grades and progress reports, group work areas, self-assessment, connection to external tools etc.*

- Administrative tools

  - *student/instructor account management, authentication/authorization infrastructure, monitoring and reporting, communication, surveys.*

- Tools that are not usually included as part of an LMS but are available separately:

  - *Virtual classrooms/web conferencing tools to add audio, video, and graphics to synchronous classes over the Internet,*

  - *Learning Objects management (e-portfolios, access to libraries) and*

  - *glossaries.*

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Generic University LMS system

Wise, L. & J. Quealy (2006). LMS Governance Project Report. Melbourne- Monash Collaboration in Institutional Technologies

LMS and corporate education

- Corporate training departments use LMSs to deliver online training, as well as automate <u>record-keeping</u> and <u>employee registration</u>.

- Corporate LMSs typically include <u>classroom registration</u> features and sometimes offer <u>e-commerce capabilities</u> (*for the payments*.)

- There is a great reliance on <u>pre-packaged, self-directed courses</u>.

  - *Generic courseware are available <u>from third party suppliers</u> but there is also the need for custom courseware for training on proprietary products and solutions, and unique situations.*

- Most corporate LMSs are <u>limited</u> in providing <u>communication tools</u>.

  - *This is <u>rapidly changing</u> as businesses recognize the value of informal learning trough the utilization of <u>communication tools</u>, communities of practice, mentoring, blogs, wikis, etc.*

LMS – tools / attributes (commercial systems)

- <u>Classroom course management</u>.

    - *Registration, course scheduling and set-up, email status notification, tracking.*

- <u>Authoring tools</u> are <u>not usually included</u> in corporate LMSs.

- <u>eLearning management</u>

    - *Delivery, <u>interoperability with third party</u> and custom courseware, testing and evaluation, communication tools.*

- Tend to emphasize the management of <u>asynchronous learning</u> (self-directed -instructor won't be present).

- <u>Blended learning</u>.

- Reporting and analytics.

    - *Ability to generate surveys and standard and custom reports in graphical form.*

LMS – tools / attributes (commercial systems)

- <u>Competency and performance management</u>.

  - *Overlap with human resources functions (performance and human capital management).*

  - *Identify needed competencies, <u>track performance</u> for both individuals and groups.*

  - *<u>Link to human resource systems</u>*

  - *Talent management*

- Tools that usually <u>are offered as separate capabilities</u>

  - *Course development/authoring, virtual classrooms/web conferencing, and learning content management (LCMS) or learning object repository (part of a suite or third-party vendors).*

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2nd Flash Activity

Ποια είναι κατά τη γνώμη σας τα βασικότερα **πλεονεκτήματα** της χρήσης των LMS, προσπαθήστε να τα κατηγοριοποιήσετε και να τα σχολιάσετε.

LMS – advantages / benefits

- The LMS primarily serves the academic mission of the institution.

- Content delivery

- Value and support teaching:

    - *online, blended, mobile, asynchronous, synchronous, with authoring tools*

- Increase the efficiency of teaching:

    - *simplifies the learning process*

- Centralized learning environment:

    - *for ensuring consistency (info consolidation), also*

    - *centralization and organization of all learning-related functions into one system enabling efficient access to these functions.*

- Analytics. Tracking and reporting for enhanced performance.

- Transform student experiences in virtual spaces

    - *enriched student learning.*

LMS – advantages / benefits

- Interaction and communication

- Assessment

- Increase technological flexibility.

- Facilitate usage (easily create courses)

  - *for managing groups, providing tools, and delivering content.*

- Cost-effective solution.

  - *Reduce training costs and workload. Decreased training redundancy and reduced operational errors and down-time.*

- Efficiency administration.

  - *Improve performance by managing resources more effectively.*

- Coordination of the learning content and guaranteed flows of information to and from students.

Standards related to LMSs

- **AICC** – Aviation Industry CBT Committee.

  - *CBT Guideline, CMI (Computer Managed Instruction) Guidelines for Interoperability between web-based courseware and LMSs, Package Exchange Notification Services (PENS), AICC Guidelines and Recommendations (AGRs).*

- **ADL** – Advanced Distributed Learning Initiative.

  - *Content Aggregation Model (CAM), Run-Time Environment (RTE), Sequencing and Navigation (SN), Sharable Content Object Reference Model (SCORM), Tin-Can (experience API).*

- **IMS** Instructional Management Systems Project / Global Learning Consortium.

  - *Content and Packaging (CP) Specification, Question and Test Interoperability (QTI) Specification, Common Cartridge (CC), Learner Profiles Specification, Simple Sequencing (SS) Specification, Learning Information Services (LIS), Learning Tools Interoperability (LTI).*

- Underlying technologies that support interoperability (e.g., XML, SOAP, .NET, and J2EE) should also be preferred.

3rd Flash Activity

Αναφερθείτε στα βασικότερα κριτήρια για την **επιλογή** ενός LMS.

Προτάσεις για την επιλογή ενός LMS για το μεταπτυχιακό που παρακολουθείτε;

Which LMS?

- Choosing a LMS isn't easy, but it is important.

- It is a <u>critical decision</u> for any training organization and is likely to have a <u>major impact</u> over several years.

- It is <u>not a technology decision only</u>. A LMS could change the <u>way of teaching</u> and educational procedures (organization's culture).

- Considerations for <u>extensibility</u>, <u>scalability</u>, and, generally, <u>how a LMS would fit</u> within the overall architecture of the organization.

- LMS's critical role has led more and more schools to want to <u>cast off</u> their first (or even second) LMS implementation in favor of one that <u>will help them better</u> meet their institutional goals (*Mission Critical: Selecting the Right LMS, D. Schaffhauser, http://campustechnology.com, 2010*)

Choosing LMS

- The process involves several steps:

  - *Identification of (instructors-learners) needs. Distinguish between the things that are <u>truly needed</u> and the <u>nice-to-have</u>.*

  - *<u>Contacts</u> with providers and open-source communities.*

  - *Search for <u>reviews</u> in the net (http://www.edutools.com)*

  - *Match <u>functionality</u>, not features.*

  - *Check references. Get <u>feedback</u> from people who are using such systems.*

  - *Demos and "<u>test drive</u>" the LMS.*

  - *Consider the <u>total cost</u> of ownership (purchase, complete implementation and maintenance costs).*

  - *Conformance with <u>standards</u> (certified as compliant to).*

  - *Hosted (SaaS) or in-house?*

  - *Commercial or open source?*

Suggestions for decision making about LMS choices

- Keep your eye on the big picture:

  - *it's not simply a decision to choose an LMS but is also a choice about a <u>strategic direction</u> for technology and learning.*

  - *LMS should be viewed as part of a <u>suite of IT systems,</u> as faculty and students are looking for a seamless interface to face their institutional life.*

- Move ahead on LMS initiatives,

  - *but be prepared for <u>innovation and change</u>.*

  - *Pilot implementations are useful ways of testing options such as <u>mobile, alternative approaches</u> to LMS or social networking, alongside the main LMS initiative.*

- Start with what you know and build over time.

  - *<u>Progress in stages,</u> not in one jump, as this allows for success over time, clarity of purpose and the ability to course correct.*

Suggestions for decision making about LMS choices

- Base the LMS model on your culture, as this will:

  - *reflect your <u>local culture and history</u>, and*

  - *support flexibility and the integration of LMS with other systems.*

- Focus on needs

  - *Determine the high-level requirements.*

- Use a strategic approach to planning with LMS specific questions.

- An inclusive process is as important as the decision itself.

  - *LMS is <u>more than an administrative tool and</u> requires a different approach to decision making.*

  - *Governance issues are important, as this is an academic and IT <u>strategic decision</u>.*

- Involve IT department

Selection criteria - 1

- Pedagogical design.

  - *Provides <u>access to content</u> as well as tools for <u>engaging</u> students, <u>interactive learning</u>.*

  - ***Ideally**: Provides access to content <u>that integrates</u> well with <u>interactive</u> tools, and <u>new pedagogical</u> tools are being routinely added to the system. Opportunities for interaction, <u>constructivist</u> or engaging methods.*

  - ***Fair**: basic access to organized materials.*

- Design and layout

  - *<u>Functional interface</u> that can be navigated with <u>minimal training</u>. Good look and feel.*

  - ***Ideally**: <u>Simple, intuitive interface</u> with minimal clicks to access materials, little or no training needed to get started, and the look and feel is inviting.*

  - ***Fair**: Functional interface with <u>decent layout</u>.*

Selection criteria - 2

- Migration of existing courses

  - *Migration tools should be provided, but the migrated material maybe need <u>additional formatting</u>.*

  - ***Ideally****: Migration tools with great documentation. All <u>migrated course materials should be ready to use.</u>*

  - ***Fair****: Some migration tools exist but the tools and documentation are either inadequate or difficult to use.*

- Content authoring

  - *Allows content to be uploaded or created within an <u>authoring tool that is part</u> of the LMS.*

  - ***Ideally****: LMS provides <u>a suite of tools for authoring</u> media-rich content, importing content, drag-and-drop interfaces, as well as uploading rich content types such as podcasts, video clips, etc. Allows <u>metadata creation</u> for easier/better management.*

  - ***Fair****: basic means for uploading and storing content in a hierarchical manner.*

Selection criteria - 3

- Content organization

  - *LMS provides a <u>repository</u> for content <u>and tools</u> for content organization.*

  - ***Ideally**: LMS provides a <u>framework for diverse storage</u> and use <u>strategies</u>, from public, private and shared workspaces, to subscription-based content (e.g., podcasts and feeds) to archival content.*

  - ***Fair**: basic repository for course content.*

- Copyright management

  - *A fixed set of <u>copyright options</u> is available to the content author.*

  - ***Ideally**: Authors are <u>given choices</u> (such as Creative Commons) for their content, and consumers (students) are reminded of their responsibilities.*

  - ***Fair**: <u>No specific tools</u> for either authoring or consuming intellectual property.*

Selection criteria - 4

- Course export

  - *Allows course structure and content to be exported.*

  - *Ideally: exports course structure and content, as well as selected sub-elements of a course, using an industry-standards such as ADL SCORM and IMS CC so that courses can be imported into another LMS.*

  - *Fair: limited ability to export to another LMS.*

- Archives

  - *Archival tools that support backup of completed courses with student submissions and discussions intact. The LMS administrator must set up instructor access to the completed course.*

  - *Ideally: Powerful archive tools that support automatic backup of completed courses with student submissions and discussions intact. Instructors have full access and control of completed courses.*

  - *Fair: Some archival tools but much of the process is manual. Archived courses are not available to the instructor.*

Selection criteria - 5

- Communication

  - *LMS provides <u>asynchronous</u> (email) and <u>synchronous</u> (chatting) communication tools with secure access.*

  - ***Ideally****: LMS provides a high level of flexibility for the use of email (asynchronous by roster, individual or group) as well as <u>instant messaging, chat and threaded discussions</u>.*

  - ***Fair****: secure access to the email addresses, but individuals may not be selectable for private email.*

- File exchange

  - *LMS provides secure <u>drop-box</u> and ability for learners and instructors to upload resources to a <u>central</u> course repository.*

  - ***Ideally****: LMS provides <u>secure drop-boxes</u> and shared folders for file exchange among students as well as instructors and <u>allows for bulk downloads</u> of attached files.*

  - ***Fair****: LMS provides drop-box functionality.*

Selection criteria - 6

- Sections and groups

  - *LMS allows <u>sub-groups</u> but gives the instructor the choice of interacting with <u>only the sub-group</u> or the <u>entire course</u>.*

  - ***Ideally**: Provides the hierarchy to <u>support sections</u> within a single course so that course content is shared among sections. Instructors can define sub-groups of students which then link to <u>separate content repositories and tools</u>.*

  - ***Fair**: Allows instructors to define <u>sub-groups of students</u> within the class roster for purposes of communication and collaborative work**.***

- E-portfolio

  - *Creation of ad-hoc or structured <u>presentations of resources</u>.*

  - ***Ideally**: Makes possible the <u>gathering, review and presentation</u> of work products to support any portfolio strategy (resumé, learning, tenure, etc.). <u>Reporting tools</u> allow for individual, departmental or institutional assessments.*

  - ***Fair**: Basic tools that allow <u>gathering student work</u> products for assessment and presentation.*

Selection criteria - 7

- Discussion tools

  - *Quick and functional with user <u>profiles</u> or pictures, file attachments and html interface.*

  - ***Ideally***: *Very fast and <u>highly functional</u> with user profiles and pictures, files attachments and easy html interface.*

  - ***Fair***: *Adequate speed and functionality with the ability to attach files.*

- Testing and assessment tools

  - *Test and <u>assessment generator</u> with the ability to add multiple choice, true/false, short answer and essay questions with <u>images</u> or other <u>attached files</u>.*

  - ***Ideally***: *Provision of tools for creating assessments with <u>multimedia</u>, learning <u>games</u>, and other interactive tools such as <u>polls</u>. Tests can provide immediate <u>feedback</u> with tips for <u>remediation</u>.*

  - ***Fair***: *<u>Simple test generator</u> with the ability to add multiple choice, true/false, short answer and essay questions.*

Selection criteria - 8

- Course evaluations

  - *Basic survey tools for capturing student reflections on course & instructor.*

  - ***Ideally:*** *Hierarchical and flexible subsystem for anonymous evaluations at course, department and institutional level for either summative or formative purposes. Includes item pools, templating, announcements, reminders, and tools to easily target different audiences.*

  - ***Fair****: Anonymous evaluations that can be gathered by the faculty including question pools and templates.*

- Gradebook and student tracking

  - *Grade book that is easy to use. Grades should be exported to a spreadsheet. Student tracking tools give the instructor some information about student progress.*

  - ***Ideally****: Highly functional grade book that is easy to use. Grades can be exported to a spreadsheet or student information system. Student tracking tools give the instructor information about what pages the student has viewed and what tasks have been completed. The student can be automatically emailed when their participation is substandard.*

  - ***Fair****: Moderately functional grade book that is relatively easy to use. Minimal tools for student tracking.*

Selection criteria - 9

- Calendar and selective release

  - *Calendar with <u>pop-up announcements</u>. Release of course content and assessments can be scheduled for student access.*

  - ***Ideally****: <u>Collaborative calendar</u> with <u>pop-up announcements</u>. Release of course content and assessments should be easily scheduled for student access.*

  - ***Fair****: Basic calendar functions.*

- Collaboration

  - *Provides access to <u>shared files</u> and some tools for asynchronous and synchronous collaboration and communication.*

  - ***Ideally****: Provides a <u>campus-wide framework</u> that supports collaborative work such as <u>wiki</u> with version tracking, threaded discussion, instant messaging and chat, <u>whiteboard</u>, web conferencing (audio and <u>video</u>). Enables subgroups to be defined within courses for collaboration. Provides non-course sites to support <u>special project work</u> among small groups.*

  - ***Fair****: Shared access to files. Tools for asynchronous collaboration.*

Selection criteria - 10

- Learning analytics

  - *Grades, basic and fine-grained <u>statistics</u> are gathered for each learner, <u>by course</u>, by <u>department</u> and across the <u>institution</u>. Reports are available for resolving controversies.*

  - ***Ideally**: Provides <u>in-depth data gathering and reporting</u> on learning outcomes based on configurable rubrics, and allows for longitudinal <u>analysis</u> of <u>cohorts as well as individuals</u>, including e-portfolios.*

  - ***Fair**: Grades and <u>basic statistics</u> are gathered for each learner, and basic usage reports generated.*

- Integration with Student Information System

  - *Tools for integration <u>automatically</u>, <u>manual</u>, or <u>batch</u> processed.*

  - ***Ideally**: Seamless integration with <u>automatic updating</u> of student and faculty lists and all rosters. Students can be <u>automatically emailed</u> course access information. Student and faculty profiles with pictures and syllabi can be shared between the LMS and the SIS.*

  - ***Fair**: Possible but requires customization.*

Selection criteria - 11

- Integration with Campus Authorization/Authentication infrastructure

  - *Ability to integrate a campus web single sign-on system such as Central or Federal Identity System.*

  - ***Ideally****: A real-time connection with a campus central/federal identity system (CAS, Shibboleth) connected with users' directories (LDAP, AD). Establishment of an IDentity Management system*

  - ***Fair:*** *batch load users from a campus central identity system.*

- Integration with library resources

  - *Ability to create resources that can be resolved to library-controlled databases.*

  - ***Ideally****: Tools are present that allow faculty to find and reference both public and licensed library materials, including full texts. Students can access these materials once logged into the system from any location.*

  - ***Fair****: Limited to no integration with locally licensed library content.*

Selection criteria - 12

- Integration with campus portal

  - *LMS is linked with the portal via single sign-on and is at least accessible through iFrame technologies.*

  - *Ideally: LMS and portal share single sign-on and select tools can be integrated with the portal via industry-standard integrations such as JSR-168 or WSRP (portlets).*

  - *Fair: LMS is accessible through the campus portal but only by linking.*

- Vision and product roadmap

  - *Availability of technical or pedagogical vision for the LMS, and the timing of future releases.*

  - *Ideally: LMS vendor or developer community has published their vision for both the technical and pedagogical aspects of the product, and timing of releases is clear and adhered to.*

  - *Fair: Does not make public their technical or pedagogical vision , and the timing of future releases may be unclear.*

Selection criteria - 13

- Support

  - *Helpdesk with e-mail support and limited phone support.*

  - ***Ideally****: 24/7 phone and email support with tracking system to follow the progress of issue resolution.*

  - ***Fair****: e-mail support only.*

- Textbook publisher support

  - *Several supported texts with good materials that can be installed.*

  - ***Ideally****: Many supported texts, excellent well-organized materials, easily installed and based on industry or community standards (SCORM or CC).*

  - ***Fair****: Some textbook materials but difficult to find, request or install.*

- Training materials

  - *Printed materials, some online training or classroom training sessions available.*

  - ***Ideally****: Excellent printed materials and many opportunities for online and classroom training sessions.*

Selection criteria - 14

- Online help resources

  - *Help files are accessible at <u>each step of a process</u>, and system documentation is accessible online.*

  - *Ideally: Contextually-appropriate help files are accessible from all pages and provide <u>assistance for students, faculty and system administrators</u> as appropriate. Pop-ups or rollovers provide "just-in-time" information for specific actions.*

  - *Fair: A <u>users' manual</u> is accessible online.*

- Use of open standards

  - *Open standards (ADL, IMS, AICC, LOM, etc.) are <u>used in the LMS</u> or are built in combination with proprietary methods.*

  - *Ideally: Open standards are incorporated wherever appropriate in the LMS and are leveraged to provide as many options as possible. <u>No proprietary components</u> are present that require separate licensing or lock in data.*

  - *Fair: Implementation of standards is <u>missing</u> or incomplete.*

Selection criteria - 15

- Speed of system

  - *Access times are very good for students <u>on high-speed connections</u> and adequate for <u>from-home-access-users</u>.*

  - *Ideally: The fastest system available with support for <u>streaming media</u> and/or offline companion materials to better serve home users.*

  - *Fair: Adequate on <u>high-speed connections only</u>.*

- Server requirements

  - *LMS is available on <u>multiple platforms</u> and offer compatibility with an implementer's choice of application server or database.*

  - *Ideally: Server software operates on a <u>wide variety of operating systems</u> (Windows, Linux/Unix) using commodity hardware and <u>industry-standard</u> web servers.*

  - *Fair: LMS only operates on <u>one operating system</u> and requires special configurations of hardware or supporting software.*

Selection criteria - 16

- Scalability

  - *LMS supports clustering and the ability for <u>multiple servers</u> to act in unison, but there are few installations supporting over <u>a thousand concurrent users</u>.*

  - ***Ideally**: LMS <u>clusters</u> well and has been known to support installations well over <u>ten thousand</u> concurrent users.*

  - ***Fair**: LMS has no problem meeting demands of a small institution on a <u>single server</u>.*

- Browser setup and support

  - *Supports <u>most browsers</u> with minimal effort from the user.*

  - ***Ideally**: Supports <u>all browsers</u> and platforms with no special setup requirements for the user. Is able to render the LMS experience in most browsers with consistency.*

  - ***Fair**: Supports the <u>most popular browsers</u> with end user set up and installation of necessary components.*

Proprietary *(paid for)* – Open Source

- Most of the propriety systems are based on <u>Microsoft .NET </u>and/or <u>Java</u> technologies (Blackboard, Desire2learn, JoomlaLMS, Learn.com, Saba Learning Suite, etc.)

- <u>Blackboard</u> and <u>WebCT</u> have dominated the education market for some time, but as costs increase, more and more organizations are looking for alternatives and <u>open-source solutions </u>are often attractive.

- Most open-source systems are based on Apache, <u>PHP and MYSQL</u>, making <u>installation simple</u> and <u>inexpensive</u> (or free), and the software for each open source LMS is free to download, install, use and update, and all have comprehensive free documentation and forums (*Eckstein 2010*).

- There are at least **50** open-source LMSs available on the market (Moodle, Sakai Project, Claroline, aTutor and others). Most of these are <u>designed for educational institutions</u>, but many corporations are adopting them as well.

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> Some of the open-source LMSs,
>
> especially when combined with social learning tools,
>
> are more **student-centered**
>
> than the commercial ones.

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Cloud & LMS

- Outsourcing the LMS hosting.

- Attractive option for <u>small to medium sized</u> educational organizations and businesses.

- Reduced <u>IT complexity</u>.

- SaaS model provides <u>high reliability and 99,99% availability</u>.

- Delivers a level of <u>scalability</u>.

- Remarks:
  - *The total <u>cost per year</u> will be <u>greater than</u> simply <u>leasing</u> the software.*
  - *The <u>total cost of ownership</u> of a period of years can be significantly <u>lower</u> because there is <u>no need to maintain an internal IT support service</u>.*
  - *<u>Service may be slower</u> because the vendor is dealing with numerous clients.*
  - *Software <u>upgrades are automatic</u>.*
  - *SaaS <u>may be less customizable</u>.*

- Public US universities: about <u>20% LMS</u> are offered (or in process) through cloud. Another <u>~27% under review</u> [*]

LMS evolution

- Like all software, LMS evolve as the market matures.

- It began simply as registration and record-keeping software to manage instructor-led instruction.

- Late 1990s: ability to launch and track eLearning.

- Since then, related tools such as improved reporting capability, e-commerce, and performance and competency management have been added.

- Today most systems can accommodate basic functionality.

- Reporting, customizations, integrations and usability are still the primary challenges.

- We expect to see integrated systems for collaboration, knowledge-sharing, employee directory and a wide variety of other collaborative solutions built right into the people management platform.

- LMSs are evolving into learner-focused systems that can better meet the changing needs of both institutions and learners.

LMS: an enterprise solution

- An LMS installation implies implementations of training, technical support and helpdesk feature across the educational organization.

  - *It is an enterprise solution for educational organizations.*

- As an enterprise system, LMS demand a variety of investments on:

  - *Financial support*

  - *Expertise*

  - *Human and not human resources*

- Educational organizations should develop policies and administrative / supportive structures around the LMS (ecosystem).

- A ubiquitous tool used in colleges and universities.

- Teachers and designers need to experiment and monitor LMS use.

LMS marketplace

- Overall, LMS market changes have been <u>driven by vendor</u> business concerns, <u>rather than</u> institutional/educational needs.

- This has resulted in raised concerns about the impact on institutions, which in turn has supported renewed discussions about <u>open-source solutions</u>, and a rethink of systems and how to organize services.

- The market for LMSs is relatively <u>mature</u> and increasingly commoditized.

- There is an ongoing <u>trend toward consolidation</u> among the major vendors which began a few years ago.

- The LMS market is <u>in a stage of rapid change</u>, and there is likely to be significant change over the next three to four years, with predictions of new LMS (LMS 3.0) software that will displace existing LMSs.

LMS marketplace

- Prices of commercial LMSs vary widely from as low as $5,000 to several hundred thousand USD depending on the features and number of clients.

- The number of LMS users is currently projected to be 73.8 million. https://gitnux.org/

- The global LMS market size is projected to grow from $23.35 billion in 2024 to $82.00 billion by 2032 with a CAGR of 17.0% (CAGR: Compound Annual Growth Rate). www.fortunebusinessinsights.com

- In 2023 the LMS market size was 20.33 billion www.fortunebusinessinsights.com

- In Europe, cloud-based LMS adoption stands at 12.5%. https://gitnux.org/

- LMS market is a global market with no clear leaders. It remains extremely fragmented and complicated with over 500 vendors (most of them for corporate education).

LMS Market Share For US & Canadian Higher Ed Institutions

SPRING 2016 VERSION
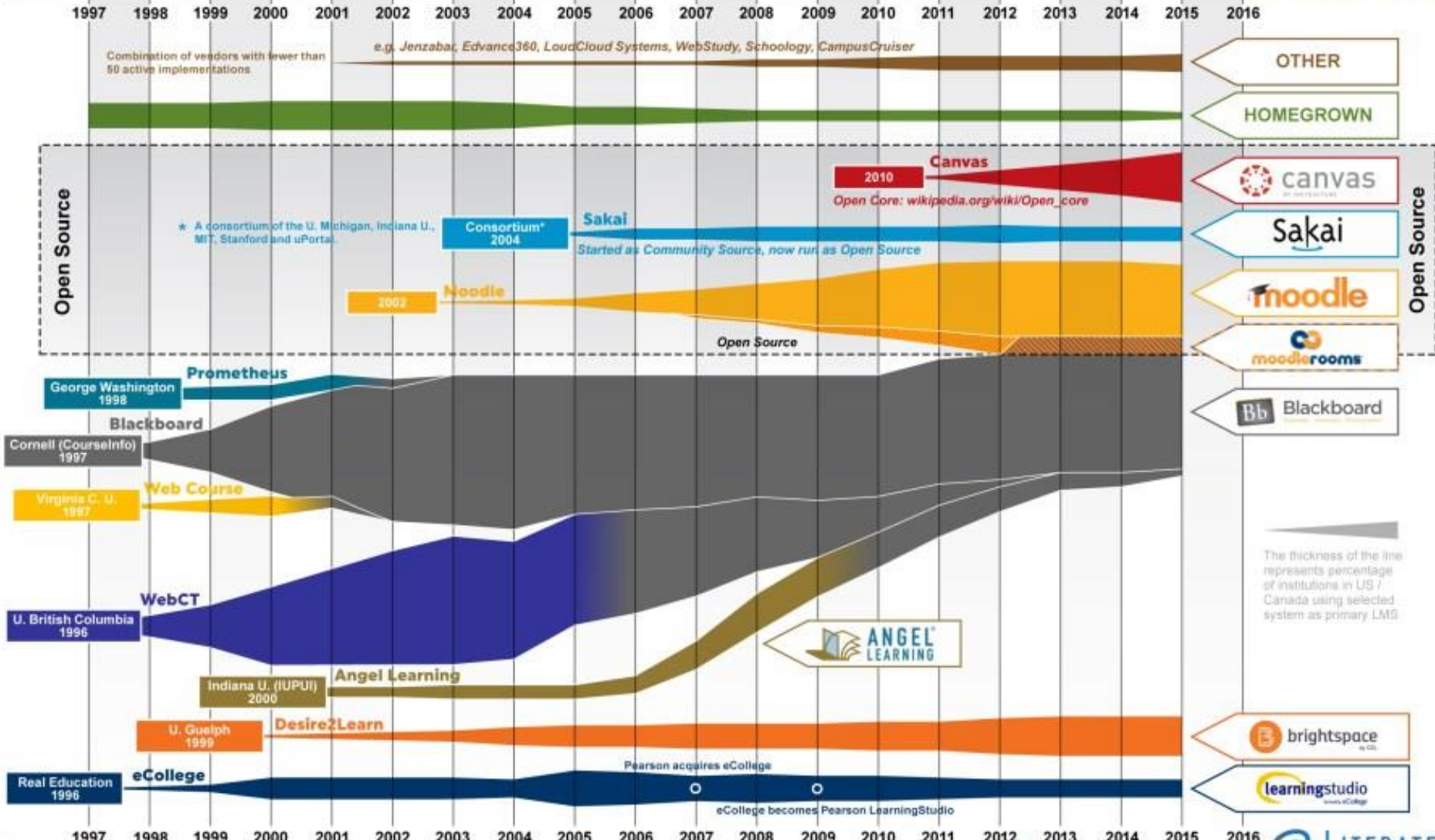
LEARNING MANAGEMENT SYSTEM → LEARNING PLATFORM

LMS Market Share For US & Canadian Higher Ed Institutions

YEAR-END 2021 EDITION
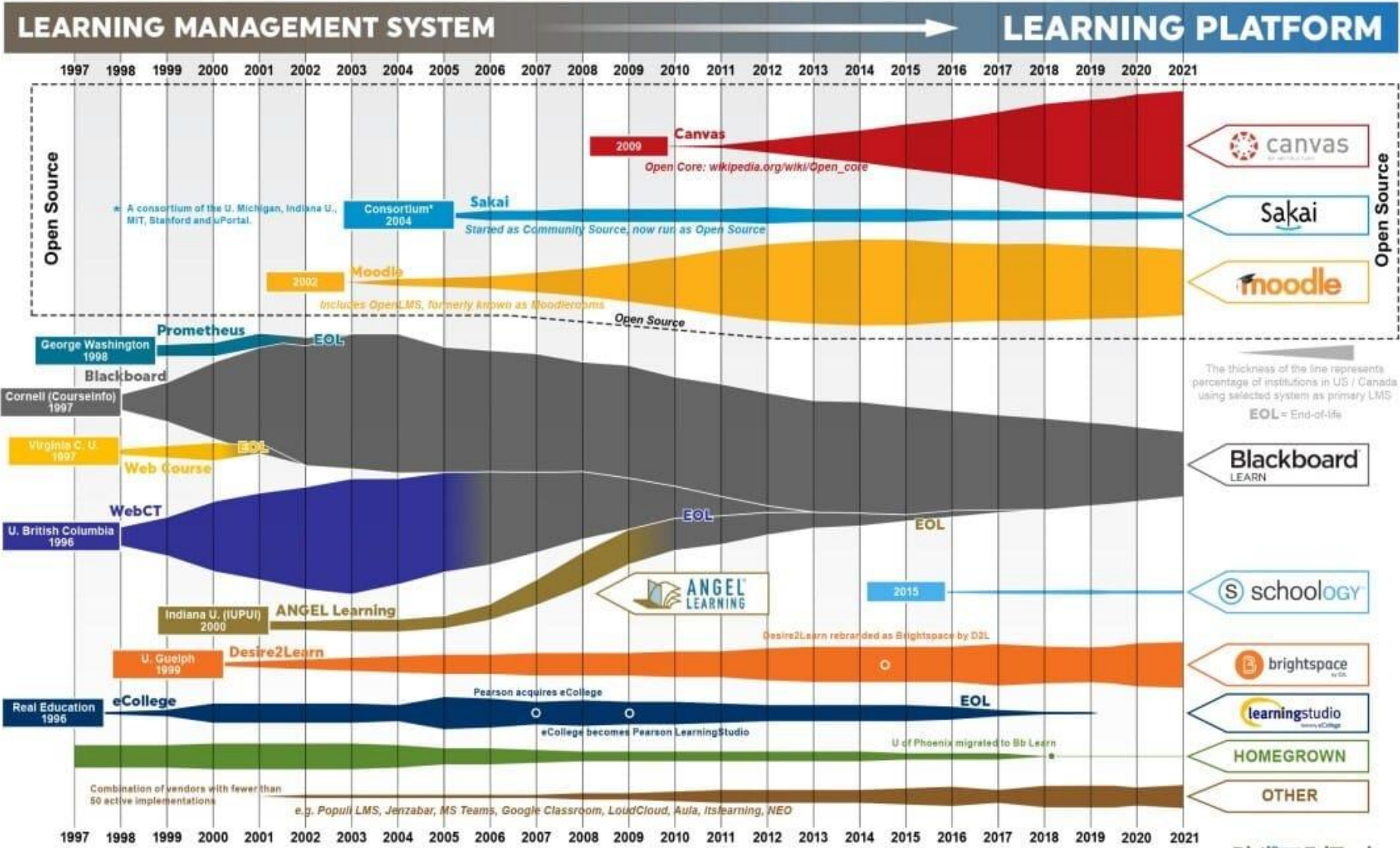
LEARNING MANAGEMENT SYSTEM → LEARNING PLATFORM

LMS usage data for HE institutions (US)

	Blackboard Learn	D2L Brightspace	Instructure Canvas	Moodle	Sakai	Other
Institutions	973	369	1147	573	72	244
	28.4%	10.8%	33.4%	16.7%	2.1%	7.1%
Enrollments	5,552,761	2,029,401	6,982,189	1,983,828	493,341	731,907
Average Size	5707	5515	6092	3462	6852	3000

Spring 2020, aggregate 500+ FTE students, www.edutechnica.com

	Blackboard Learn	D2L Brightspace	Instructure Canvas	Moodle	Sakai	Other
Institutions	703	427	1469	453	43	143
	19.9%	12.1%	41.7%	12.8%	1.2%	4.1%
Enrollments	5,846,124	3,779,238	13,510,576	1,757,035	235,902	942,899

500+ FT unduplicated headcount (3523 schools as of fall 2023), www.edutechnica.com
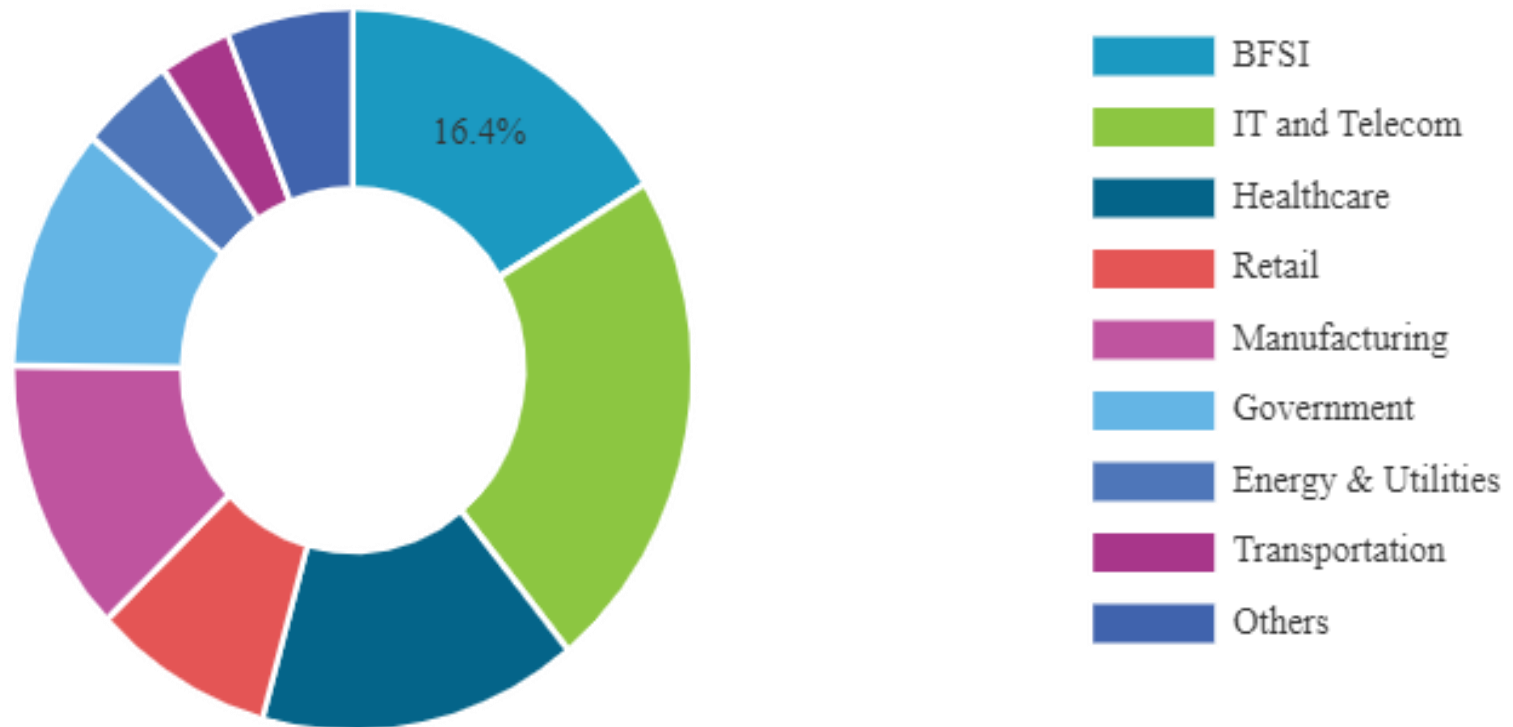
Trends in LMS market for HE institution (US)
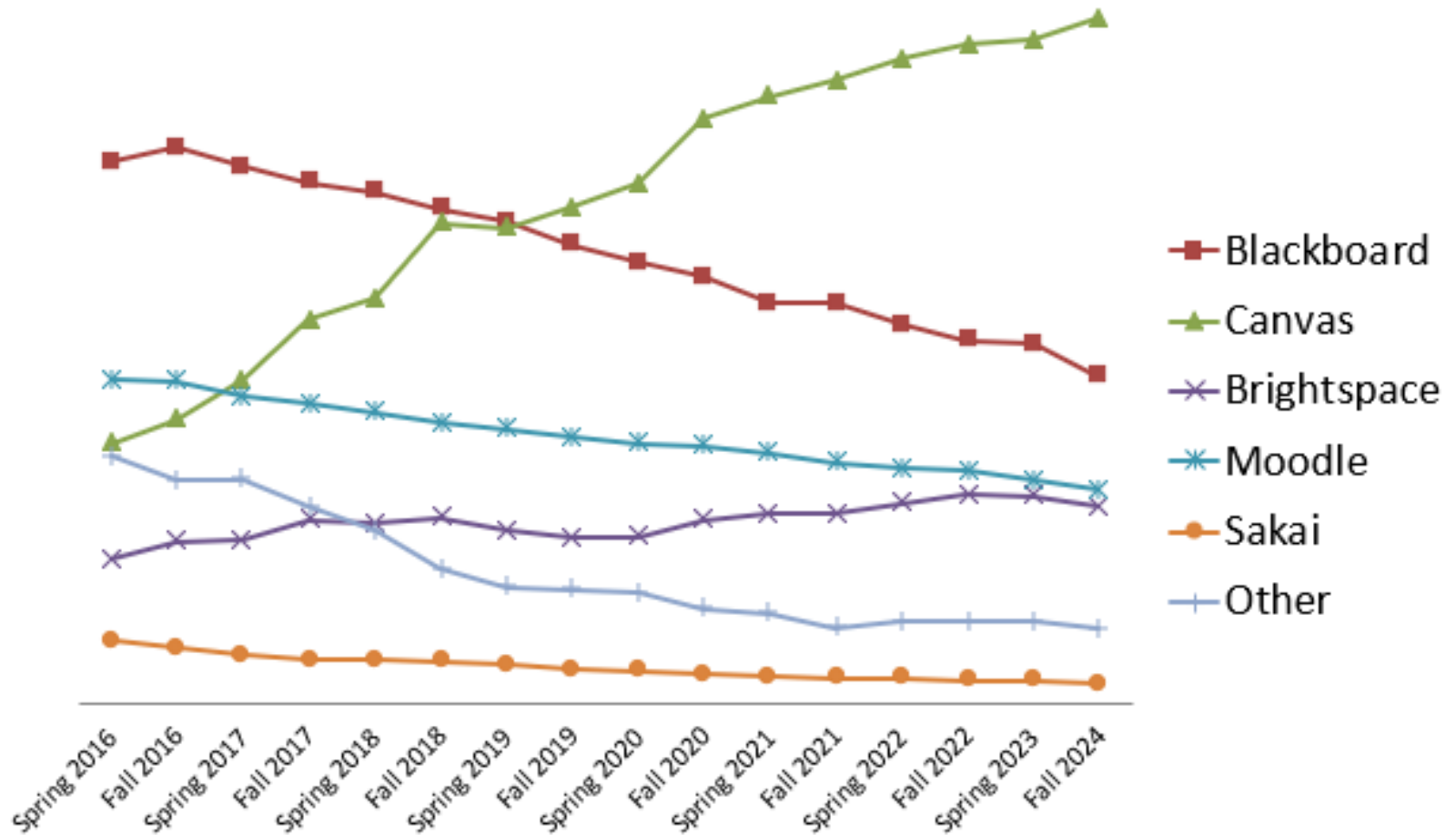
US HE; all tracked schools, www.edutechnica.com

Global LMS market share (corporate)

Global Learning Management System (LMS) Market Share, By Corporate, 2023

16.4%

- BFSI
- IT and Telecom
- Healthcare
- Retail
- Manufacturing
- Government
- Energy & Utilities
- Transportation
- Others

www.fortunebusinessinsights.com

BFSI: Banking, financial services and insurance

Learning Management System Market, By End-Use, 2021 – 2032, (USD Billion)

28.9   38.7

Corporate Academic Government   Academic   Government
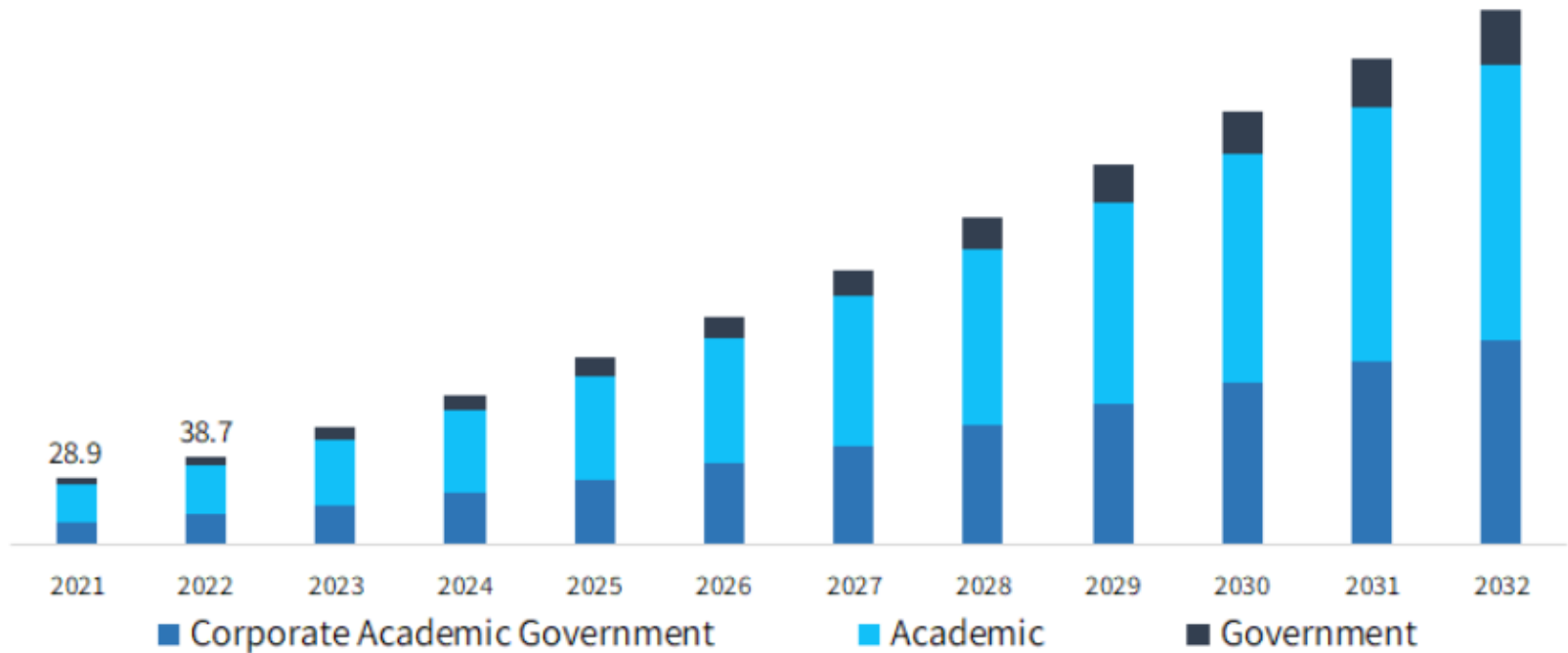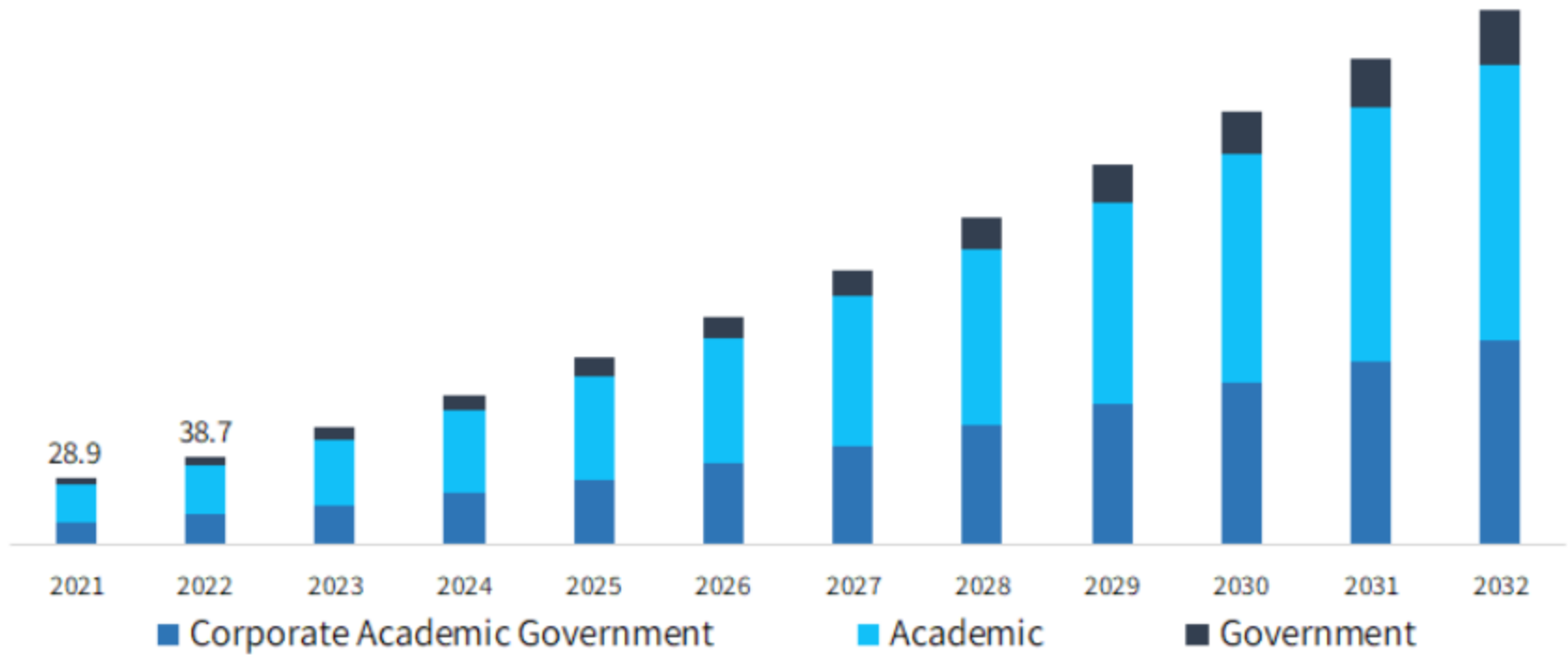
Source: www.gminsights.com

Conclusions

- Internationally LMSs have become nearly <u>ubiquitous</u> across the higher education sector as a core component of eLearning.

- One of the <u>fastest growing technology</u> in the history of Higher Education.

- LMS are enterprise level, server-based software systems used to manage and deliver (through a web browser) learning of many types, <u>particularly asynchronous eLearning</u>. They generally also include the capability of tracking and managing many kinds of learner data, especially that of learner performance<u>(*)</u>.

- <u>LMS market is very much in transition</u>.

- <u>Future of LMS market and technologies</u>: Careful consideration is required about how to respond to key strategic drivers that are influencing the <u>transition to LMS 3.0</u>, including new models of LMSs, <u>increasing use of Web 2.0</u> technologies, <u>mobile learning</u>, <u>cloud technologies</u>, and the increasing use of <u>LMS analytics</u>.

Learning Management System Market, By End-Use, 2021 – 2032, (USD Billion)

Source: www.gminsights.com