

THE MASSIVE OPEN ONLINE COURSES OF THE HELLENIC OPEN UNIVERSITY: CONFIGURATION AND ANALYSIS OF SPECIFICATIONS FOR THE SELECTION OF THE MOST SUITABLE PLATFORM

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Abstract

Given that the actions in hosting Massive Open Online Courses are limited in Greece, the Hellenic Open University and, specifically, the Laboratory of Educational Material and Educational Methodology implements the project "MOOC.HOU". The current project aims to design high-quality MOOCs that promotes research, blended learning, and Distance Education's pedagogical principles. In this vein, the recent case study aims to present the specifications and the selection process of the most suitable LMS platform for HOU's MOOCs.

To achieve this, the Department of Creating and Managing Electronic Courses of HOU set the specifications of a Learning Management System as a MOOC provider via a complete prototype table. The specific table was formed based on a comparative study that took place in two phases. The first is a quantitative process of the essential features that the selection platform must-have. The second qualitative Phase evaluates the different capabilities of the two most suitable platforms, Moodle and Open edX. Finally, the particular characteristics of each platform were checked following the specific pedagogical goals set by HOU. All the criteria for selecting an LMS suitable for MOOCs have been established.

As a result, all the technical and pedagogical features where Moodle and Open edX show capabilities and weaknesses have emerged compared to each other. Furthermore, the disadvantages of each platform have been assessed, and solutions have been explored. Finally, factors have emerged that need to be considered due to the unique nature of the HOU. Conclusively, the research results highlight the pedagogical and technical aspects that must be matched with the specific nature of HOU's goals. Based on this, the specific case study can be used as a guideline framework to define the specification of the above platforms as a MOOC provider. The platform that HOU selected was Moodle.

Keywords: comparative study, distance learning, MOOC, Moodle, lifelong learning, Open edX.

1 INTRODUCTION

The Hellenic Open University (HOU) is the only public university institution in Greece that provides the possibility of distance learning through undergraduate and postgraduate programs. In fact, from 2017 onwards, the Hellenic Open University offers a large part of its study programs exclusively online, while pre-existing ones are in the process of being developed in this direction [1].

In this vein, HOU considered the purely online nature of education in which it leads and seeks to enhance, the possibilities of lifelong learning and specialization it provides, the difficulties faced by its students during their experience with distance education, the phenomenon of abandonment by specific groups of students, as well as, the fact that in recent years in Europe there is an increasing trend of adoption of MOOCs by higher education institutions, decided to welcome the implementation of the MOOC project.

Based on the above, the ultimate goal of the Department of Creation and Management of Electronic Courses of HOU is proceeding with the implementation of the project " MOOC.HOU " to seek, through a consortium of Greek HEIs, the development of an upcoming standard policy. The main targets of the specific project are:

- The research through MOOC in the field of user learning analysis,
- The auxiliary offer of moocs through the formation and development of introductory and support courses in the modules of study programs offered at the undergraduate and postgraduate level,

- The development of MOOC courses of general interest, to meet the interests (lifelong learning), as many potential students (of all ages and specialities) as possible,
- The integration of the pedagogical principles of distance education and adult education in the pedagogical planning of its MOOC courses.

In Greece, unique academic activities in providing MOOCs courses constitute the Mathesis of the University of Crete providing 37 courses (<https://mathesis.cup.gr/courses>) and the Coursity through the partnership of the University of Ioannina and Aristotle University of Thessaloniki with 13 courses (<https://coursity.gr>). Most likely, the gap observed in Greece in higher education compared to the growing trend of development of MOOC courses in Europe signals their low demand from the Greek public due to issues of mismanagement by universities.

2 METHODOLOGY

The choice of the hosting platform of HOU's MOOC courses was based on a comparative process of the Learning Management Systems (LMS) that the HOU already use. HOU uses the two open-source software, Moodle and Open edX, to support its training needs.

The current comparative process was in two different phases. These phases ensure an in-depth and multi-level thorough assessment. In particular, in Phase A, the comparison was based on thematic axes-criteria, defined by the Department of Creation and Management of Electronic Courses of HOU. These axes were established by grouping the characteristics set by HOU (subcriteria) so that an LMS is a functional provider of MOOCs after first being thoroughly analyzed. The grouping process led to six broad categories, which were the main criteria - thematic axes of HOU. In the 2nd Phase, a qualitative evaluation is made based on the quality control of the collection of characteristics resulting from the synthesis of the six criteria of HOU and the five criteria (Massiveness, Openness, Classification of the material into sections, Interaction and Evaluation) [2].

3 RESULTS

In Table 1, based on the specific and general specifications of HOU, the essential criteria and sub-criteria that an operating system must meet for the provision of MOOC courses were defined. At the same time, a check was made between the two open-source platforms, Moodle and Open edX. Specifically, it was checked by thematic criterion, if each platform meets the sub-criteria set. The condition determines the completeness of the criteria that each platform responds positively to all the characteristics that are set as necessary in the subcriteria of each standard.

Table 1: Moodle and Open edX: quantification of the criteria met by the Moodle and edX platforms.

Designation		Description	
<i>Moodle</i>	<i>Open edX</i>	<i>K.1. Does the training institution have a central system that provides support for building and maintaining e-learning infrastructure? (Learning Management System - LMS)</i>	
✓	✓	K.1.1	The training provider has ensured that the LMS complies with established systems management practices
✓	✓	K.1.2	The training provider has ensured the existence of a documented plan to support, maintain and upgrade existing technologies. The LMS is reliable and operates with measurable standards such as system outage monitoring. An emergency plan has been implemented to keep systems, data and support services running in a prolonged service outage.
✓	✓	K.1.3	The training institution has taken care of a documented plan for creating backups at the LMS and the course level.
✓	✓	K.1.4	The training provider has a documented technology plan that includes electronic security measures
✓	✓	K.1.5	LMS can interface with Human Data Management Systems (Electronic Data Management Systems) and with Electronic Resource Management Systems (Human Resources Systems).

		<i>K.2. Does the LMS have basic capabilities for managing users of different roles?</i>	
✓	✓	K.2.1	It is possible to create a user account and enrol in a course guided by the administrator (Administrator initiated).
✓	✓	K.2.2	It is possible to edit the rights of users, roles, courses and, in general, the LMS.
✓	✓	K.2.3	It is possible to browse the list of trainees for various actions such as searching and editing users.
✓	✓	K.2.4	The possibility of individual and mass editing of users is available.
		<i>K.3. Does the LMS have basic course management capabilities?</i>	
✓	✓	K.3.1	The possibility of creating and deleting courses in LMS is available.
✓	✓	K.3.2	The possibility of customized course availability (adding and deleting weeks/sections, hiding sections, etc.) is available.
✓	✓	K.3.3	The possibility of scheduling activities or even weeks/units is available.
✓	✓	K.3.4	It is possible to create multiple sections per lesson.
✓	✓	K.3.5	Grading and feedback tools for trainees are available.
		<i>K.4. Does the LMS have basic capabilities for managing Educational Content?</i>	
✓	✓	K.4.1	The ability to integrate and play multimedia material such as video and audio files is available.
✓	✓	K.4.2	There is the possibility of creating tests and evaluation tasks (assessments) and options of assigning, submitting, correcting and grading these tasks.
✓	✓	K.4.3	The possibility of integrating educational resources by third parties is available.
✓	✓	K.4.4	The possibility of reusing educational resources is available.
✓	✓	K.4.5	The possibility of interconnecting/integrating courses or educational resources developed with the AICC, SCORM, xAPI, cmi5 standards is available.
✓	✓	K.4.6	It is possible to write course content with authoring tools compatible with the above standards.
✓	✓	K.4.7	The fast-switching interface is available in multiple languages.
		<i>K.5. Does the LMS have basic reporting capabilities?</i>	
✓	✓	K.5.1	The possibility of Reporting trainees is available
✓	✓	K.5.2	The possibility of Reporting a course and the option of Reporting educational activities is available.
✓	✓	K.5.3	The ability to Report user activity on the system is available.
		<i>K.6. Does the LMS comply with international guidelines on Web Content Accessibility?</i>	
✓	✓	K.6.1	LMS supports the development of content that complies with the WCAG 2.0 AA standard regarding access to web content by stakeholders.
✓	✓	K.6.2	LMS supports the development of content that complies with the standard (ATAG) 2.0 for the production of new web content.
✓	✓	K.6.3	LMS supports the development of content that complies with the ARIA 1.0 specification for access to assistive technologies in LMS.

According to Table 1, Moodle and Open edX meet the six essential criteria and all their subcategories.

Subsequently, the advantages and disadvantages of both platforms are given comparatively places based on the number of tools and capabilities that gather and relate exclusively to the field of educational and pedagogical support. The differences were identified in the pedagogical approach and management of learning, assessment and grading, media, collaborative learning, and content development and management (Table 2).

Table 2. Educational and Pedagogical Support: The characteristics of the Moodle and Open edX Platforms (Differences).

	Moodle	Open edX
Learning Management		
E-portofolio	(third party)	
Content layout by apprentice-level	(third party)	
Evaluation and Scoring		
Anonymous evaluation	✓	
Interceptor controller	(third party)	
Self-assessment		✓
Greater plugin compatibility	✓	
Mapping features of correct answers		✓
Overall Grade Range		✓
Evaluation type presentation		✓
Presentation of the scope of the participants' obligations		✓
Communication Media		
Chats	✓	
Collaborative Learning		
Collaborative work (Wiki, Google Docs)	✓	✓
More Opportunities to collaborate in the Forum	✓	
Content Development and Management		
Video Creation and Development	✓	(third party)
Video Analysis Checker		✓
Content structure and director mgmt.	✓	
Metadata sharing	✓	
Video database build	✓	
Pedagogical approach		
Modern pedagogical design	✓	

Next, the feature set will focus on each platform's features, providing more outstanding capabilities. Therefore, in the following Tables (3,4,5,6), the powers of Moodle and Open edX in terms of openness, massiveness, learning analytics, and material classification will be analyzed.

Table 3. Scalability (Open-Source Platform): Differences in features of Moodle and Open edX Platforms.

Features	Moodle	Open edX
World community (age)	++	+
Plug-in	++	+
Tools synchronization features	+	++

Moodle and Open edX provide open access and freedom regarding tracking rate, registration, access space, and start time. At the same time, they are open-source, which means that the user can constantly evolve their features. The Moodle platform was first released in August 2002. In contrast, the edX platform was released in May 2012. The antiquity of Moodle results in building a robust global community that is constantly evolving and promoting new features (plugins), many of which are free. At the same time, it offers additional help and valuable guidance in technical matters [3].

Respectively, edX, although more recent, having a solid community and using advanced tools such as XBlocks, LTI components, JSinput, Open X REST APIs, Custom Grader, acquires excellent flexibility in terms of extending its features, achieving high-quality design. Although it does not have so many Moodle plugins, it more easily synchronizes the elements it will integrate. In fact, according to [2], this self-sufficiency of Moodle in tools makes it difficult to integrate into other systems, presenting compatibility difficulties, such as connecting to social media such as Twitter and Facebook (interoperability difficulties). At the same time, in a possible and necessary upgrade, the Open edX platform can synchronize its tools so that they are in line with the respective version, in contrast to the Moodle platform in which possible plugins can stop evolving based on the version of the platform.

Table 4. Big Data Analytics: The capabilities of Moodle and Open edX Platforms.

<i>Features</i>	<i>Moodle</i>	<i>Open edX</i>
Insights	++	+
Big Data Analytics	+	++

In particular, according to Table 4, both systems provide the ability to report user activity (Insights). In particular, Moodle has an overview and visualization system, each section with detailed reports by user, team and duration of activity. Respectively, Open edX cites reports of student progress through an overview of activities and visualization of results. However, according to [4], Moodle provides more outstanding capabilities in the reporting system. Although Open edX is one of the essential platforms for MOOC course providers, it generally has limited functions at the level of analysis (Learning Analytics) [5]; [6].

This fact is observable on almost all MOOC platforms. However, the Open edX platform hosts MOOCs from world-renowned universities such as Harvard, MIT, and Stanford, reinforcing Open edX. Also, the universities are committed to being key drivers behind Open edX technology while being involved in its development [7]. Similarly, Moodle, although widely used for e-learning courses by many universities, the coverage needs at the level of learning analysis-behaviour are not readily achievable, as managing data and handling information from the database becomes very complicated with Moodle [8].

According to [9], the problem is identified when the amount of data in the database is too large. For [6], in addition to the issue of the data resource parameter, there is also the issue of Moodle limiting the access time parameter. Specifically, in Moodle, the filtering of raw data depends on the types of action, hours and activities by default.

Table 5. Material Classification: The characteristics of the Moodle and Open edX Platforms.

<i>Material Classification</i>	<i>Moodle</i>	<i>Open edX</i>
More User-friendly Platform	+	++

According to Table 5, both platforms can organize the material into sections to present an organized course structure. In Moodle, the material can be perceived when accessing the platform. In this space, the central part of the topics and the content of the courses are presented. In contrast, in Open edX, the course structure is on the left in a list of topics, where the content of each topic becomes visible only when each topic is open. At the same time, the ability to organize the sections based on a calendar, which is provided on both platforms, is beneficial. According to [3] the platform of Open edX offers the possibility to the user to navigate to the material more easily and quickly become familiar with the environments.

Table 6. Maximum number of concurrent supported users per course on the Moodle and Open edX platforms.

<i>Platform</i>	<i>Maximum number of users</i>
Moodle	10.000
Open edX	300.000

Finally, according to Table 6, both platforms can accommodate a large number of users simultaneously. However, Open edX, compared to the Moodle platform, can host 30 times more users at the same time than Moodle. Specifically, the number in Moodle amounts to 10,000, while in Open edX to 300,000. Therefore, although both platforms qualify for simultaneous mass support, Open edX outperforms this component [10].

The availability of a large number of educational tools and technologies used to support them is the factor that limits the Moodle platform to the number of users. However, the Open edX platform using Nginx server technologies and its core technologies (e.g. Python using the Django framework and MongoDB databases for courses as well as MySQL for users) can provide faster management of the platform resources and to deliver more quickly the support of a vast number of users.

4 CONCLUSIONS

According to the Phase A of the comparison study, both platforms used by HOU, Moodle and Open edX fully meet all six criteria were set by HOU. It is judged whether an operating system is suitable for providing MOOC courses. Specifically, both operating systems can be hosted on a local infrastructure owned by the HOU. At the same time, they have a central course management system, reports, educational content, users of different roles while complying with international guidelines for accessibility of web content.

Respectively, from the results of Phase B, it emerged that Open edX prevails over Moodle in issues related to massiveness, capabilities in the field of learning analytics, upgrading and synchronization of its tools. Also, it is better on matters related to the user's convenience to browse the platform environment (friendlier environment). Therefore, if the only purpose of HOU MOOCs were research and massiveness, the most appropriate platform would be Open edX. After all, it is no coincidence that Open edX defines itself as a CMS platform.

Unlike Open edX, which has few but appropriate educational tools, Moodle has a wealth of educational evaluation tools and resources, as well as a robust global community of support and development features, more extensive than Open edX. At the same time, the clear educational orientation of Moodle (Social constructivism) achieved through the provision of tools that allow more collaborative actions in its environment adjusted with a better reporting system make it a platform that can provide a high-quality learning experience. Moreover, Moodle identifies itself as LCMS with an emphasis on learning. Therefore, if the priority for MOOCs of HOU is the maximum possibilities regarding educational planning and pedagogical orientation, Moodle is considered as a more suitable hosting platform.

HOU acts exclusively in distance education and incorporating in its pedagogical philosophy the principles that govern Adult Education. In this vein, HOU should adopt MOOC courses that will function to disseminate the pedagogical quality that it provides as an institution by utilizing its know-how in distance education issues to offer innovative teaching methods distinguished by high educational planning.

From the above, it appears that Moodle's educational and pedagogical possibilities make it a more suitable platform for the "MOOC.HOU" project. Moreover, from the comparative investigation, possible limitations placed on Moodle compared to Open edX were deemed easily accessible. Furthermore, the use of the Moodle platform by all HOU curricula and the integration of Hadoop into a Moodle environment reinforces the choice of Moodle over Open edX, even in areas where it was found that Open edX prevails.

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