

E-learning platforms in the Italian Universities: the technological solutions at the University of Bari

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Abstract: - In the era of globalization of goods and services difficulties in knowledge diffusion still remain. The effective exchange of experiences and skills is not guaranteed by the enormous potentials of internetworking systems and devices.

E-learning technologies represent a good opportunity to reduce the digital divide and to ensure faster and higher development trends. Several universities and companies are currently involved in using e-learning systems to provide a valid solution; this notwithstanding several problems related to e-learning activities still remain open.

This paper presents an analysis of the e-learning technologies used in the Italian Universities. The most widespread open source and commercial Learning Management Systems (LMSs) are investigated and presented. Successively, a simple model is proposed and used to perform a comparative evaluation of the adopted systems. Finally, the activity experienced at the "Rete Puglia" Centre of the University of Bari is described and the most relevant results are illustrated.

Key-Words: Academic Education, Distance Learning, E-learning, Knowledge Building, Knowledge Exchange.

1 Introduction

Knowledge exchange is a very complex process; although Internet makes the exchange of information possible at high speed rates, knowledge sharing and know-how broadcasting is still an open problem that is waiting for suitable solutions [1, 2].

Distance Learning has a very long history (Figure 1) that started in Europe since the beginning of the last century. In fact, one of the earlier forms of distance learning was done through correspondence courses. In this case paper documents were prepared and sent to students by postal service, and learners provided their feedback in the form of filled questionnaires and documents to the teachers for the examination.

Although in the era of the Internet this approach seems quite primitive, it is worth noting that also in the last decade some post-doc courses have been organized according to this distance learning paradigm.

With the development of audio and video tapes the modality of producing courses has changed and the market has increased drastically. As radio and television devices became more diffuse, they have been also used for distance learning. This is the case of the "Nettuno" Network that has been the first example of television-based university. Nettuno uses two satellite television channels (RAI NETTUNO SAT1 and RAI NETTUNO SAT2) and also Internet to deliver courses and to perform all didactic activities. Nettuno uses a didactic model which adopts both in presence learning and distance learning. The specific model considers distance learning as comprehensive of activities in which the student is a self-learner that interacts with new technologies and performs new activities. These instruments bring him to interact with other people both face to face and in distance mode [3, 4].

More recently, since Internet makes possible to use didactic material without space and time

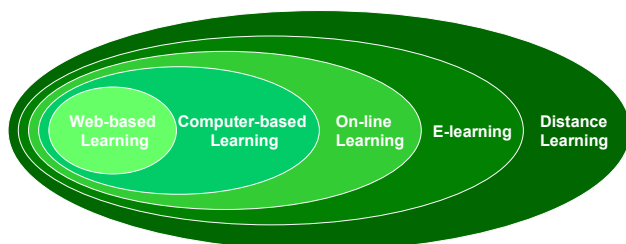


Figure 1. Distance Learning evolution

constraints, web-based learning has been considered with special interest [5, 6, 7]. Therefore, e-learning market has continuously grown up, and also many Universities have been attracted by e-learning systems and solutions [8, 9].

In the academic field, the choice of a Learning Management System (LMS) is of great relevance for any e-learning activity/project intended to deliver didactic modules for higher education.

In this paper from the consideration that e-learning is based not only on technological tools but also on a complex environment in which the process of teaching/learning occurs [10, 11, 12], some of the main aspects of e-learning are focused and an overview on the situation in the Italian Universities is presented. In particular, the e-learning platforms adopted by the different Italian Universities are firstly discussed. Successively, a comparative analysis of the different platforms is performed. Finally, some solutions currently in progress at the Center "Rete Puglia" of the University of Bari are highlighted.

2 The e-learning process

The teaching/learning process is extremely complex since it involves people with different abilities, needs and expectations. Furthermore, when the teaching/learning process occurs by means of e-learning systems, additional aspects must be carefully considered.

2.1 Cultural

One of the most relevant barriers to the effective diffusion of e-learning concerns the cultural and personal attitudes of teachers towards e-learning. In fact, in many cases the teacher lacks of specific experience, training and motivation in working in ICT-based educational environments. Of course this activity requires additional time for the teachers in order to prepare well-defined didactic material (learning objects) for students and also specific time for cooperation with students. It is worth noting, in fact, that the idea of learning as a collaborative process is very important when students are separated by distance. In this sense it is absolutely necessary that the teacher encourages and monitors collaborative learning [13, 14, 15, 16].

2.2 Technological

The perfect running of systems and devices is very relevant for e-learning activities. Equipment malfunctions can produce a great detriment for an e-learning course. Therefore, in order to avoid negative judgments on the overall perceived quality

of the course, it is necessary that possible technical problems are foreseen and the adequate interventions are planned. The preparation and experience of the staff is very relevant to reduce and overcome technical difficulties [17, 18].

Another relevant aspect hindering the diffusion of an effective e-learning is due to the lacking of skilled personnel able to meet the application needs and deal with the different required skills [19].

2.3 Environmental

The trivial assumptions that distance learning is impersonal and dehumanizing has been recently revised on the basis of the evidence that a strong feeling of learning community can be developed also in ICT based distance environments. Moreover, as clearly stated also by the European Community Commission, undeniably e-learning can be as efficient as traditional learning [20, 21, 22, 23].

Of course, quality of e-learning tools, products and processes is of paramount importance for the success of education programs. In this sense, several models have been proposed to "measure" quality and impacts of e-learning processes. Of course, the selection of the strategy, or the combination of strategies, need to be performed according to the interests of all stakeholders [24, 25, 26].

2.4 Economical

In general, the cost-effectiveness of an e-learning program is very difficult to evaluate at least as its efficacy [27]. In fact, e-learning is not so convenient if costs related to the realization of e-learning products are considered. Indeed, the human resources necessary to obtain e-learning products with a good level of quality have a relevant cost that is often ignored [28, 29].

For this purpose, several initiatives have been defined by the EU, such as [30, 31]:

- The "eLearning – Designing Tomorrow's Education" programme;
- The plan of action delineated in Commission's Communication to European Council and Parliament (2001, 28 March);
- The European Social Found including Long-Life learning measures.

2.5 Political and Regulatory

As many innovative tools and practices, also e-learning is waiting for complete regulations. Still today there is a great debate in several EU countries on the legal validity of certifications obtained by e-learning courses, also in comparison with certifications obtained by traditional courses.

Moreover, notwithstanding several e-learning universities (universities providing exclusively e-learning courses) have been organized and regulated by specific rules, their effectiveness is still to be completely verified [32].

3 Situation in the Italian Universities

This section presents an overview on the LMS platforms used in the Italian Universities, showing how the various Universities are trying to develop their own models for e-learning. Successively, a simple evaluation tool is proposed and used for the evaluation and comparison of some LMS platforms.

3.1 LMS platform choices

As Figure 2 shows, some Italian Universities are adopting commercial platforms, other ones are using open-source ones, and ad-hoc solutions are also in progress in some cases. A few universities have not adopted at all any e-learning solution. Figure 3 reports distribution of the different types of LMSs. Table 1 shows the platforms adopted in the Italian Universities. Observing services and functions, it results evident that they realize different models, methods, implementations and technologies.

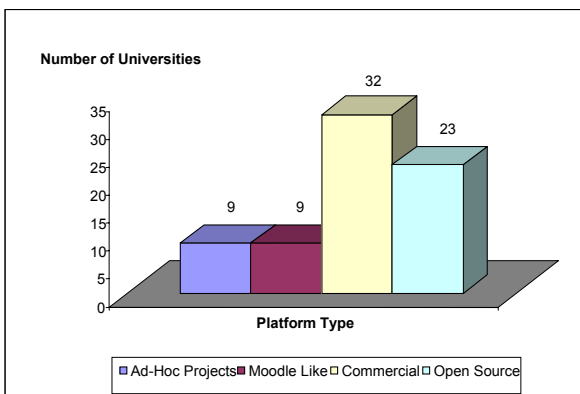


Figure 2. LMS platforms in the Italian Universities

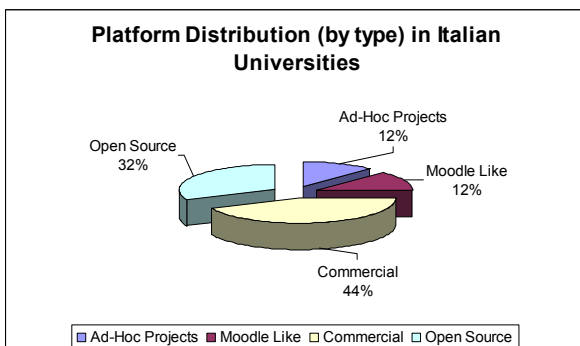


Figure 3. LMS distribution (by type) in the Italian Universities

PLATFORM \ UNIVERSITY	IlIAS	Plone	uPortal	Atutor	Claroline	Docebo	Mytwn	Webct	Moodle	Moodle-like	IBM Lms	OracleLMS based	Blackboard	OTHERS
ANCONA								X						
AOSTA														X
BARI - UNIVERSITA'									X			X		
PERGAMO	X										X			X
SBOLOGNA				X	X	X			X					X
BRESCIA – S. CUORE													X	
BRESCIA – UNIVERSITA'												X		
CAMERINO									X					X
CAMPOB. – S. CUORE												X	X	
CASSINO														X
CASTELLANA									X					
CHIETI									X					
COMO - DELL'INSUBRIA													X	
COSENZA - DELLA CAL.														X
CREMA - UNIV. MILANO														X
FERRARA														X
FIRENZE									X					
GENOVA										X				
LECCE										X				
MACERATA		X	X				X	X						
MESSINA														X
MILANO STATALE														X
MILANO BOCCONI											X			
MILANO POLITECNICO														X
MILANO BICOCCA						X								X
MODENA e REGGIO EMIL.										X				
ALESS. NOV. VERC.										X				
NAPOLI FEDERICO II											X			X
NAPOLI ORIENTALE														X
PADOVA									X					X
PALEREMO										X				
PAVIA														X
PERUGIA										X				
PISA									X					
ROMA LA SAPIENZA									X					
ROMA TOR VERGATA														X
ROMA TRE									X					
ROMA CATTOLICA														X
SASSARI										X				
PALEREMO								X						
SIENA									X					
TORINO									X					X
TRENTO														X
UDINE							X							
URBINO														X
BARESE													X	
VERONA														X
VENEZIA				X										
VITERBO					X									

Table 1. LMS platforms in the Italian Universities

Among the various platforms, Moodle is the most utilized, it is followed by Blackboard, the IBM LMS and the Oracle LMS. In some Universities more than a single platform is adopted, according to specific needs and particular requirements.

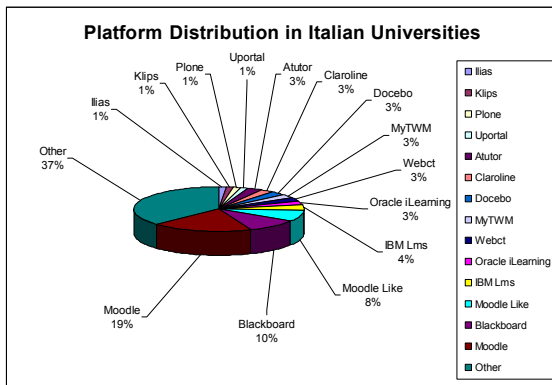


Figure 4. LMS distribution (by name) in the Italian Universities

Figure 4 presents the distribution of the most utilized LMS platforms in the various Universities.

Moreover, Figure 5 shows the results concerning the simplicity in reaching e-learning services starting from the home page of the various Italian Universities. The 35% have a link directly in the home page of the institution; the 10% have a link in the didactic section; the 22% do not have an explicit reference to e-learning activity in institutional web pages, but e-learning activities can be accessed by learners through search engines; the 30% of the Italian universities do not offer a visible link to e-learning services; whereas the 3% present an incorrect link.

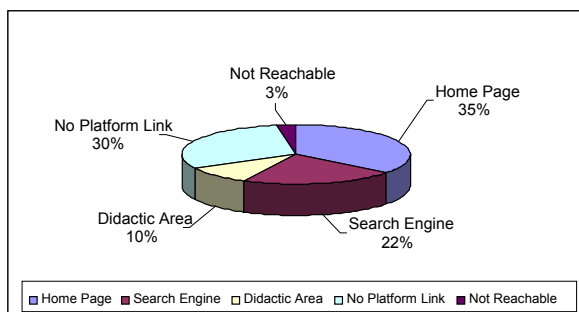


Figure 5. LMS platforms visibility

3.2 LMS platform comparison

In order to evaluate the LMS platforms, a well suited evaluation model has been developed and presented in this paper.

The model considers the following five characteristics: system parameters, administration facilities, interaction support, teacher services, and learner services. Moreover, each characteristic consists of various sub-characteristics.

System parameters section considers: compliance with standards, search engine availability, additional contents inclusion, on-line help availability,

scalability with respect to student number, accessibility, language support (Italian), privacy management.

Administration facilities section considers: login security, installation easiness, interface personalization, activity tracking, upgrade facility, documentation availability.

The interaction support section considers: availability of an integrated e-mail system, mailing-list management, forum availability, chat system availability, notice board support, integrated videoconference system implementation, group and classes management, service personalization.

The teacher services section considers: availability of integrated authoring tools, type of possible additional contents, availability of statistics, possibility of developing tests, support of vertical interaction between students and teachers.

The student service section considers: interface friendliness, different course type support, possibility of planning activities, possibility of vertical interaction with teachers and tutors and horizontal interaction with other students.

Each feature has been evaluated, according the standards of estimation of *ISO 9001:2000* reported in Table 2. The score 0 represents an unsatisfactory judgement; the other three scores graduate the level of the satisfactory judgement.

Global Judgement	Level	Score
SATISFACTORY	High	3
	Medium	2
	Sufficient	1
UNSATISFACTORY	Unacceptable	0

Table 2. Judgement Scores

Five experts have anonymously evaluated each sub-characteristic of the different LMS platforms, assigning a score from 0 to 3. In this way, the strength and weakness points of the different LMS platforms are focused.

For the evaluation procedure the following open-source LMS platforms have been considered: ATutor, Claroline, Docebo, Ilias, Moodle, Plone, uPortal. In addition also the Oracle iLearning LMS platform, which is hosted at the "Rete Puglia" Centre of the University of Bari, has been considered. The results are reported in Table 3.

The evaluation process shows that some open source LMS platforms are adequate to support effectively e-learning processes, as well as the Oracle iLearning LMS that, in some cases, outperforms the most effective and diffuse open source platforms.

Characteristic	Sub-characteristic	Atutor	Claroline	Docebo	Ilias	Moodle	Plone	uPortal	iLearning
System Parameters	Compliance with Standards	3	2	2	2	2	3	2	3
	Search Engine Availability	3	3	1	3	3	3	3	3
	Additional Contents Inclusion	3	3	1	3	3	3	3	3
	On-line Help Availability	3	3	1	0	3	3	1	2
	Scalability (student number)	3	3	3	3	3	3	1	3
	Accessibility	1	2	3	1	2	3	2	2
	Language Support (Italian)	3	3	3	3	3	3	1	3
Administration Facilities	Privacy Management	1	3	1	1	3	1	1	3
	Login security	3	3	3	3	3	3	3	3
	Installation Easiness	1	1	1	0	1	3	0	2
	Interface Personalization	3	1	3	1	3	3	1	1
	Activity Tracking	3	2	0	3	2	0	3	3
	Upgrade Facility	1	1	3	0	3	0	0	3
Interaction Support	Documentation Availability	1	1	1	1	1	3	1	1
	Integrated e-Mail System	0	0	0	0	0	0	0	0
	Mailing List Management	3	3	3	0	3	0	1	2
	Forum Availability	3	3	1	0	3	0	1	3
	Chat System Availability	3	3	3	0	3	0	3	3
	Notice Board Support	3	3	3	3	3	3	0	3
	Integrated Video-Conference System	0	0	3	0	0	0	0	2
	Group and Class Management	3	3	3	0	3	3	3	3
Teacher Services	Service Personalization	1	3	1	3	3	3	1	2
	Integrated Authoring Tool	0	1	1	1	1	0	3	2
	Types of Additional Contents	1	3	3	0	3	3	3	3
	Availability of Statistics	3	3	3	1	1	0	1	2
	Development of Tests	3	3	1	1	3	0	3	3
Learner Services	Vertical Interaction Tools	1	3	1	1	3	1	3	3
	Interface Friendliness	2	3	2	0	2	2	1	2
	Different Course Type Support	2	3	1	0	3	3	1	3

Table 3. LMS Platform Evaluation

The following images graphically show some of the obtained results. As it can be seen there is no LMS that outperforms the others in respect to all characteristics. In particular, by considering System Parameters, the most valuable platforms are Claroline, Moodle, Plone and iLearning (Figure 6); by considering Administration Facilities: Moodle, Plone and iLearning (Figure 7); by considering Interaction Support: Atutor, Claroline, Docebo Moodle and iLearning (Figure 8).

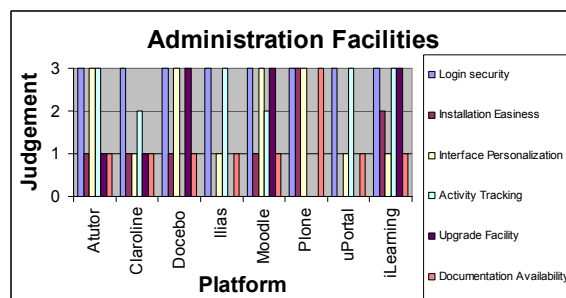


Figure 7. Administration Facilities results

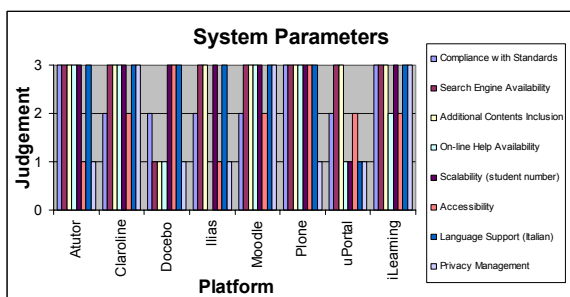


Figure 6. System Parameters results

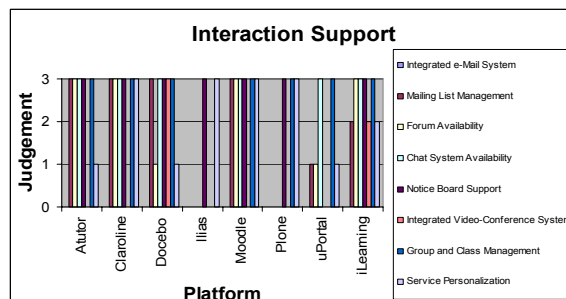


Figure 8. Interaction Support results

4 Experiences at the University of Bari

The “Rete Puglia” Centre started its activities on distance learning in 1996. The Centre has the aim to support the introduction and massive use of ICT and e-learning technologies not only into the various Faculties of the University of Bari, but also into the entire Regional Academic System and into the various Institutions and Companies of the Apulia Region [33].

The activity of the “Rete Puglia” Centre has been realized according to three major projects [34, 35]:

- The RETE PUGLIA project;
- The PROTEO project;
- The SCORE project.

These projects allowed the realization of a technological infrastructure able to gain, collect and distribute the know-how in the different knowledge domains. On the basis of the results achieved, the “Rete Puglia” Centre has become the pilot Centre specifically devoted to train students to use e-learning in the University of Bari. To develop activities, a specific functional model (Figure 9) has been considered [34, 36], consisting in:

- Area Centres (A.C.);
- Concentration Centres (C.C.);
- Specification Centres (S.C.).

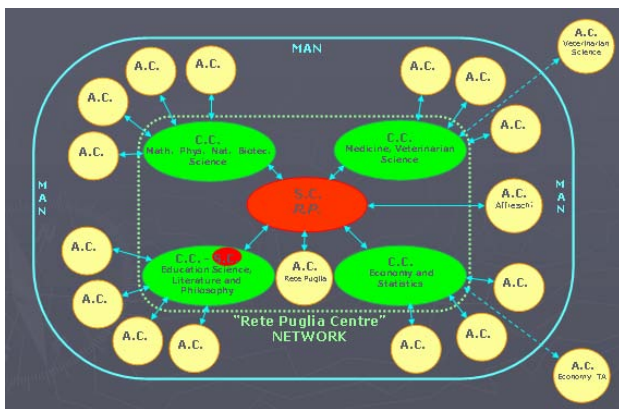


Figure 9. PROTEO functional model

Each area centre has been provided with a “Multimedia University Desk”, which has been specifically developed and patented for the purpose [37, 38]. Furthermore, for the start-up of the project several ICT equipments, and the necessary servers, have been placed in the “Rete Puglia” Centre [39].

On the realized hardware infrastructure, the netLearning (Figure 10) learning environment system, based on Oracle iLearning, has been installed and configured to store the Learning Objects (LO) produced by using the course maker (CM) “Lectora Publisher” [39, 40].



Figure 10. netLearning platform

The main features of the CM are: Advanced Learning Object management; Accessibility by standard browsers; Accessibility to courses by disabled people; Easy integration of multimedia components; Development of educational products by people without programming experience.

The main features of the LMS are: Integration of standard didactic contents; Management and publication of didactic contents and multimedia material; Starting, in progress and final test management; Complete tracing capabilities of individual learning activities; Reporting and statistics capabilities; Creation and management of user profile; Creation, planning and administration of educational remote activity; AICC and SCORM compliance; On-line help and fully documentation; Accessibility by standard browsers; Virtual Classroom with audio-video on-line interaction among users, electronic blackboard, application sharing; E-mail facilities; Forum and message management.

Furthermore, in order to allow effective communications from the servers to the users in the University of Bari, a gigabit Metropolitan Area Network (MAN) is used (Figure 11) to connects the “Rete Puglia” Centre with the teaching rooms [41].

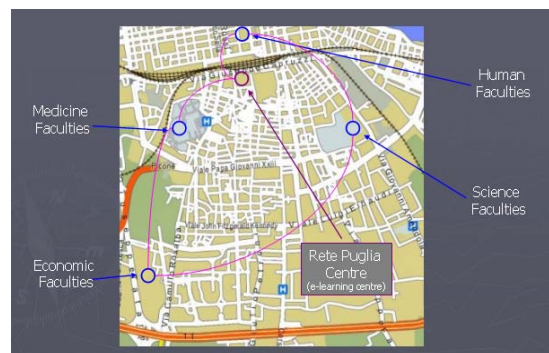


Figure 11. Bari University main poles

Finally, a well-defined portal (Figure 12) has been realized to give all students access to the platform for the e-learning activities [42].



Figure 12. web-learning home page

Of course, the use of technologies and systems is sustained by supporting the teachers of the University of Bari, also by well-defined courses on the use of CM and LMS (Figure 13). Similar courses have also been disposed for the training of administrative secretaries and technicians of the University of Bari [34, 43].



Figure 13. LMS administration page

The efforts carried out at the “Rete Puglia” Centre are producing a growing community of teachers interested in e-learning. Some of them have produced some learning objects, as for: Operating Systems, Office Automation, Multimedia System, Methodologies and Statements for a basic course of Latin Language, a Trip to Apulia through Images, Human Anatomy [42], Economic Geography: Ambient Certification, Data Warehouse, Teaching on Cultural Heritage, A Culture in Playing: to Construct Consciously the European Estate; Microscopic Anatomy and Neurology Anatomy, Audiometric Techniques, Salento Transformation in 18th and 19th century, Historical Profile of the University of Bari, Sources and Methods to Study Families in the Modern Age, Matlab: Optimization Toolbox, History of International Relations: an Introduction, History and Foundations of Physics.

The evaluation of processes and products has been also accomplished by adopting well-defined protocols and quality models, according to the UNI EN ISO 9000-Vision 2000 [44, 45].

5 Conclusion

E-learning is a powerful tool for knowledge acquisition and know-how exchange. In this paper some of the key aspects and open problems concerning e-learning activities are focused and discussed.

The analysis of the choices carried out by the Italian Universities to provide e-learning solutions has been presented. A simple and specifically built quality model to compare the various LMS platforms is here presented. It has been used to perform a comparative evaluation by considering the various adopted open-source LMS and the Oracle iLearning LMS platform, available at the Rete Puglia Centre of the University of Bari.

Finally, the experience matured at the “Rete Puglia” Centre of the University of Bari by using the Oracle iLearning Platform to promote the integration of e-learning technologies in higher education has been carefully described.

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