



# BABYLON & ONTOLOGY

The European Educational Social Network

Babylon & ONtology: Multilingual and cognitive e-Learning Management System via PDA phone.  
Funding Programme: Lifelong Learning Programme 2007 - Multilateral project - Key Activity 3 - ICT.

**Funding Programme:** Lifelong Learning Programme 2007 - Multilateral project - Key Activity 3 - ICT.

---

## Deliverable 4.1: Analysis of existing technology from the BONy's partners

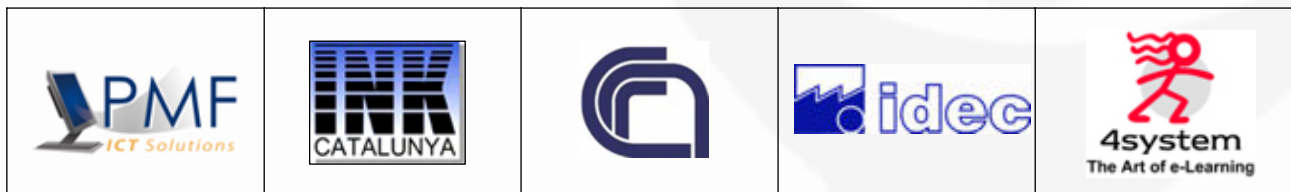
---

**Deliverable Co-ordinator:** Marco Bennardo

**Deliverable Co-ordinating Organisation:** P.M.F. S.r.l.

**Contributors:**

- Manuele Manente (P.M.F. S.r.l.)
- Alfio Gliozzo (C.N.R. I.S.T.C.)
- Aneta Zydziak (4system Polska Sp. z.o.o.)
- Aris Chronopoulos (IDEC S.A.)
- Florenca Nava (INK Catalunya S.A.)





---

## BONY Consortium

This document is part of BONY project, financed with the EC funds in the domain of "Lifelong Learning Programme" managed by EACEA, number 135263-2007-IT-KA3-KA3MP. The following partners are involved in the BONY project:

- P.M.F. S.r.l., Catania, Italy. Project coordinator ([www.pmfonline.net](http://www.pmfonline.net)).

Via Mario Sangiorgi n. 37  
95129 Catania (Italy)  
Tel. +39 095 2936355  
Fax +39 1782771686

- INK Catalunya S.A., Barcelona, Spain ([www.inkcat.es](http://www.inkcat.es)).

Valencia, 279, ático  
08009 - Barcelona (España)  
Tel.: + 34 934 961 600  
Fax: + 34 934 873 900

- C.N.R. I.S.T.C., Roma, Italy ([www.cnr.it](http://www.cnr.it)).

C.N.R. - Piazzale Aldo Moro, 7  
00185 Roma  
Telefono +39 06 49931  
Fax +39 06 4461954

- IDEC S.A., Piraeus, Greece ([www.idec.gr](http://www.idec.gr)).

Iroon Politechniou 96  
Piraeus 185 36  
Tel: +30 210 4286227  
Fax: +30 210 4286228

- 4system Polska Sp. z.o.o., Zielona Góra, Poland ([www.4system.com](http://www.4system.com)).

ul. Botaniczna 70  
65-392 Zielona Góra, Poland  
Phone.: +48 (0) 68 451 08 88  
Fax: +48 (0) 68 451 08 88 ext. 2



---

## Work package participants

The following partners have taken an active part in the work leading to the elaboration of this document, even if they might not have directly contributed writing parts of this document:

- P.M.F. S.r.l., Catania, Italy. Project coordinator ([www.pmfonline.net](http://www.pmfonline.net)).
- INK Catalunya, S.A, Barcelona, Spain ([www.inkcat.es](http://www.inkcat.es)).
- C.N.R. I.S.T.C., Roma, Italy ([www.cnr.it](http://www.cnr.it)).
- IDEC S.A., Piraeus, Greece ([www.idec.gr](http://www.idec.gr)).
- 4system Polska Sp. z.o.o., Zielona Góra, Poland ([www.4system.com](http://www.4system.com)).



## Reviews History

Version	Date	Modifier	Remarks
0.1	30/03/2008	Bennardo	First draft
0.2	31/03/2008	Manente	Comments
0.3	29/06/2008	Bennardo	Second draft
0.4	30/06/2008	Manente	Comments
0.5	29/07/2008	Bennardo	Draft + Partners feedbacks + Questionnaire results
0.6	30/07/2008	Manente	Comments
0.7	31/07/2008	Bennardo	Final version



---

## Executive Summary

Analysis of existing technology from the BONY's partners. The aim of this Deliverable is to analyze the existing technology that partners would leave at disposal for the BONY's project so as to define the final architecture of the BONY's system. A questionnaire to assess existing owned or open source LMS as been developed and submitted to consortium member in order to value and select the best e-learning platform for the BONY use-case.



## Table of Contents

<b>1. Introduction .....</b>	<b>7</b>
<b>2. Specification of the criteria for the choice of platforms.....</b>	<b>7</b>
<b>2.1. BONY Partner Survey.....</b>	<b>7</b>
<b>2.2. LMS Criteria Survey .....</b>	<b>7</b>
<b>2.3. LMS Features Survey.....</b>	<b>9</b>
<b>2.4. Survey Delivery .....</b>	<b>11</b>
<b>3. Candidate Learning Management Systems .....</b>	<b>11</b>
<b>3.1. Dokeos .....</b>	<b>11</b>
<b>3.2. E-Logos.....</b>	<b>12</b>
<b>3.3. Moodle.....</b>	<b>12</b>
<b>3.4. WBTServer .....</b>	<b>12</b>
<b>4. LMS comparison .....</b>	<b>12</b>
<b>4.1. Standards Compliancy .....</b>	<b>12</b>
<b>4.2. Usability, User-friendliness, Multilingual Support .....</b>	<b>13</b>
<b>4.3. Developer Documentation, SDK, Community .....</b>	<b>13</b>
<b>4.4. Integration with other Systems.....</b>	<b>13</b>
<b>4.5. Cost of Ownership and licensing .....</b>	<b>13</b>
<b>4.6. Scalability &amp; Security.....</b>	<b>14</b>
<b>4.7. Search Engine .....</b>	<b>14</b>
<b>4.8. Application Portability .....</b>	<b>14</b>
<b>4.9. Features .....</b>	<b>14</b>
<b>4.10. Summary Table .....</b>	<b>14</b>
<b>5. Conclusions and recommendations .....</b>	<b>15</b>



## 1. Introduction

This report gives an analysis of the state of the art of existing technology from the BONY's partners to fit to the project's requirements and provides a support definition of BONY's system architecture.

To accomplish this task the project team decided to evaluate the Learning Management System used by the partners. For the evaluation of the e-learning platforms, several criteria were collected merging and consolidating the results from the questionnaire and from previous evaluations by the project partners.

On the basis of these results information was gained on which platform would meet best the requirements of the future steps.

## 2. Specification of the criteria for the choice of platforms

The aim of BONY is to develop a cognitive Learning Management System ( LMS ) allowing users to find and learn the units strictly requested and strictly necessary to achieve their training experience. Due to costs and time to develop a new LMS, the project team decided to study an existing platform in order to implement only the necessary modules. The software modules developed will interact to LMS with defined communication protocols such as API or Web Services. For these reasons the platform choice is strategic for the whole project.

In this paragraph we exam the evaluation criteria in order to find the best LMS solution from the partners.

### 2.1. BONY Partner Survey

In order to gain information from BONY partners we have delivered a survey specifying e-learning platform technical and functional requirements.

The survey was divided into two parts. In the first part, the LMS general criteria are analysed, while in the second part we looked at the functionalities offered by such LMS.

In order to evaluate the specific criteria some questions were given to partners to analyse better the platform used. Every criterion is studied against a scale of evaluation, going from 1 indicating poor results to 5 indicating excellent results. Survey participants will be required to answer all questions and will also have the chance to support their answers with feedback.

As not all criteria and functionalities have the same importance within BONY project, every criterion was given a different rating.

### 2.2. LMS Criteria Survey

<i>Criteria</i>	<i>Question/Rating</i>
<b>Standards Compliancy</b>	Does the LMS adhere to specifications like SCORM, IMS, OKI, AiCC?



	Can the LMS import and manage content and courseware that complies with standards regardless of the authoring system that produced it?
	Is XML support available?
<b>Usability, User-friendliness, Multilingual Support</b>	Will the program require lots of training or is it fairly intuitive to use?
	How available is documentation, how useful are guides, training and online help?
	How long will it take for faculties to set up their courses at a basic level?
	Does the system support additional languages?
<b>Developer Documentation, SDK, Community</b>	How available is documentation for developers?
	Is there a support community?
	How available is Source Development Kit ( API Web Services etc )
<b>Integration with other Systems</b>	Does the solution allow for ready integration with other systems?
<b>Cost of Ownership and licensing</b>	What are the costs for licensing, software, hardware and custom development requirements?
	How fast can the LMS be up and running?
	What level of expertise is required?
	What kind of support and assistance are available?
<b>Scalability &amp; Security</b>	Is the program suitable for both small and large installations?
	How easily does the solution allow for growth of users, content, functionality?
<b>Search Engine</b>	Has the LMS an integrated search engine?
<b>Application Portability</b>	How efficient is the LMS support portability to PDA phone?





### 2.3. LMS Features Survey

<i>Features</i>	<i>Feature Statements</i>
<b>Administration</b>	Manage user registrations
	Set curricula, chart certification paths Administer internal budgets, user payments, and chargebacks.
	Create standard and customized reports on individual and group performance. Reports should be scalable to include the entire workforce.
	Print Certificates.
	Build schedules for learners, instructors, and classrooms.
	Misc. Comments
<b>Security</b>	Encryption
	Authentication
	Misc. Comments
<b>Access</b>	Individual/Group Login and Password
	Manage user profiles, define roles. Assign tutors.
	Browser accessible
	Course Authorization. Instructor approves enrolment
	Registration Integration. Prerequisite Screening, Cancel Notification
	Misc. Comments
<b>Integration with Other Systems</b>	Integration with HR Systems
	Integration with CRM. Student listing. Maintain student information.
	Misc. Comments
<b>Course Design, Development and Integration</b>	Customizable look and feel
	Support for classroom and virtual courses
	Course templates
	Use and access to Learning Objects
	Web authoring



	Support multimedia types
	Accessibility Compliance
	Instructional design tools
	Curriculum Management
	Easy Navigation/linking
	Easy Course structuring
	Extensible Architecture
	Support style sheets
	Misc. Comments
<b>Course Monitoring</b>	Course Listing/Catalogue
	Course Descriptions
	Schedules and Availability
	Usage Tracking
	Misc. Comments
<b>Assessment Design</b>	Creates Test Questions and Facilitate Test Administration
	Automated Testing and Scoring
	Course Path Maintenance
	Competency Mapping/Skill Gap Analysis
	Self-assessment
	Misc. Comments
<b>Online Collaboration and Communications</b>	Email
	chat rooms
	help desks
	file exchange
	wiki
	blog
	whiteboard
	discussion groups/forums
	Misc. Comments
<b>Productivity Tools</b>	Bookmarks
	Calendar/Progress Review
	Orientation/Help
	Search



	Work offline/Synchronize
	Misc. Comments

## 2.4. Survey Delivery

To deliver the survey to the partners we chose an online tool. The survey-tool in use is located online: <http://freeonlinesurveys.com/>

## 3. Candidate Learning Management Systems

The project team has collected and merged the information on the basis of the results gained from the above mentioned criteria. The evaluation focussed mainly on the open-source platforms (due to monetary reasons), but the commercial platform as e-Logos and WBTServer were incorporated too.

Not all partners took part in the survey as some of them do not work with LMS as one of their corporate core businesses.

<i>BONy Partner</i>	<i>LMS</i>	<i>Licence Type</i>	<i>Vendor</i>	<i>Url</i>
P.M.F. S.r.l.	Dokeos 1.8.5	Open Source	N.A.	<a href="http://www.dokeos.com/">http://www.dokeos.com/</a>
	e-Logos 2.0	Commercial	VITECO S.r.l.	<a href="http://www.elogos.it">http://www.elogos.it</a>
INK Catalunya S.A.	None			
C.N.R. I.S.T.C.	None			
IDEC S.A.	Moodle 1.8	Open Source	N.A.	<a href="http://www.moodle.org">http://www.moodle.org</a>
4system Polska	WBTServer	Commercial	4system	<a href="http://www.4system.com">http://www.4system.com</a>
	Moodle 1.8	Open Source	N.A.	<a href="http://www.moodle.org">http://www.moodle.org</a>

### 3.1. Dokeos

Dokeos is the Open Source platform proposed by P.M.F. and developed by the Dutch company Dokeos. The project was developed from a previous version of Claroline (a fork) and became in a short time a project with its own character. The main aim is to help teachers create pedagogical content, structure activities while using learning paths, interact with students and follow their learning advancement through the monitoring system. Dokeos has quickly met great enthusiasm among users in MNEs, federal administrations and universities in some 60 countries for a total of



1,000,000 users. It's an LMS easy to use and very reliable at the same time. It supports the SCORM standard and incorporates tools for contents generation.

### **3.2. E-Logos**

e-Logos ® is the commercial solution offered by P.M.F. The platform was developed by an Italian company called VITECO S.r.l. and presents as main characteristics the high usability and userfriendliness. The software was developed with the ASP, II 6 and MySql technology, and adapts very well to small-scale e-learning projects. This LMS supports the SCORM standard 1.2 and as it has been marketed only in Italy so far, it does not provide a multilingual support.

### **3.3. Moodle**

Moodle is one of the most used Open Source LMS solutions presented in the e-learning market. Its community of users and developers is spread all over the world and in comparison to other systems it is renowned, among all its applications, for the high quality of pedagogical aspects provided, in accordance to the constructionist theory. This LMS possesses all required characteristics needed for BONY implementation, it is translated into 70 languages, it complies with the SCORM standards and its functionalities can be developed by using hundreds of plug-ins.

### **3.4. WBTServer**

WBTServer is an LMS developed by the BONY partner 4system and it helps to manage the remote learning process (effective online education) with ease and coordinate e-Learning trainings. Using the WBTServer platform allows to fast and easily access the content as well as to quickly communicate with the system users. Thanks to the structure of WBTServer, it is possible to adjust the functionality of the learning platform to individual needs of the Client. It is SCORM compliant and offers many types of customisation.

## **4. LMS comparison**

The project team decided to give more relevance to open source solutions to engage development team and to have support from community. Moodle got the highest ranking in this criterion.

All LMS proposed are SCORM compliant, in particular with the SCORM 1.2 .

Another relevant criterion on which the final choice was made is the availability of an integrated search engine. Among all platforms Moodle WBT Server e Dokeos provide such a module.

The explanations below show comparison details for each criterion.

### **4.1. Standards Compliancy**

The LMS need to adhere to specifications like of e-learning industry like SCORM, OKI, IMS. It is very important that LMS can import existing courseware developed with an e-learning standard. To manage the LO metadata descriptor LOM (Learning Object Metadata) the LMS need to support XML. All LMS proposed are SCORM compliant in particular with the SCORM 1.3, except e-logos which is compliant to the older SCORM 1.2. This is one of most important criteria because the project aims to embed SCORM Meta data with ontological information.



## **4.2. Usability, User-friendliness, Multilingual Support**

The project team wishes to choose an easy and intuitive software for users and administrators too. Features like "course preview", "help-functions" and "training-requirements" were focused on. At first sight, there are no significant differences between the LMS about the offered functions, but looking at each system as a whole it became apparent that some applications are not user-friendly. Not the number of the offered functions made the difference, but ease in navigation through the system and finding the desired function did. Also due the multilingual nature of the project we need to consider the availability of LMS languages.

The best LMS solution seems to be Moodle thanks to more than 70 languages available. Dokeos is designed to multilingual implementation too, furthermore it has a translation tool (Dokeos Language Translation Tool). At first sight, there are no significant differences between the Learning Management Systems in regard to Usability and User-friendliness, but looking at each system as a whole it became apparent that Moodle is not as user-friendly as Dokeos. Not the number of the offered functions made the difference, but ease in navigation through the system and finding the desired function. Dokeos clearly offers the best user-friendliness system in comparison to the other tested systems.

## **4.3. Developer Documentation, SDK, Community**

To develop XML-based e-learning services it is important to have all the necessary documentation. Guide, source code, examples are the bases to develop and know the LMS framework. Existing developer community could give an advantage for the coders.

This requirement was evaluated with maximum weight. The largest developer Community in the world is the Moodle Community involving University, companies and developers. The Dokeos community is rapidly expanding in Europe and gives an useful support with help services and documentation. Given the commercial scope of other LMS proposed, there are not any communities of developers for WBTSer and e-logos even if they have excellent documentation.

## **4.4. Integration with other Systems**

Because the LMS needs to be integrated with other system like Social Network Framework, CMS, ERP, it is important to investigate if the LMS provide Web Services, API to retrieve users and training information. The Learning Management System WBTSer, Dokeos, can be customized to work with other systems such as CRM, ERP, SAP. There are few implementations of Moodle integrated with other systems. This aspect is very relevant to interface the LMS with the OWL engine. Moodle has more than 1000 plug-in web services and Moodle API based, this grant implementation of others. Dokeos follows a philosophy of a small basic nucleus with pluggable extensions and customizations. This gives developers the opportunity of easy design plug-in and tool.

## **4.5. Cost of Ownership and licensing**

In order to evaluate maintainability we need to consider the cost of ownership. The Open Source solutions could be a good option because there are no license costs. Also the setup support and administration are different from an LMS to another.

As described above, the evaluation focused mainly on open source platforms due to costs of license and following patent problems. We have chosen Dokeos instead of Moodle because project team "know how" can be cost-effective.



#### 4.6. Scalability & Security

The solutions must be suitable for both small and large installations because there is no forecast in the potential number of BONY's users. We have to consider which level of security the LMS can offer, if it can handle security or authentication schemes or have any tool for digital right management DRM.

Dokeos is suitable for small or big projects. Since Moodle is usually used in Academic contests, Dokeos implementation covers different areas as corporate, medical, and public administrations. All tested O.S. platforms have high levels of security supporting SSL, XSS, CSRF, SQL injection, and Browser vulnerability are dealt with and solved by using the latest version of code.

#### 4.7. Search Engine

The Search Engine Tool is an useful function in LMS because it gives users the ability to find digital content from learning repository. In particular BONY project aims to develop a semantic search engine using ontology, so the presence of this module is very relevant for the survey.

Looking at the "Search Engine" in Moodle, students can search all discussion Forums in their course and all glossary entries. Dokeos has search modules to find keywords in courses and users.

None of LMS tested have Learning Object Metadata search capabilities.

#### 4.8. Application Portability

One task of WP4 is to configure a mobile phone access to BONY e-learning platform, using a PDA Phone as a client, so finding an LMS which support mobile access could be a necessary requirement for the project. None of LMS viewed have native mobile implementation, although there are some projects for Moodle and WBTServer.

#### 4.9. Features

Almost all LMS provide a set of functionalities for cataloguing, managing and distributing contents. Some platforms have richer sets of functionalities compared to others, and these can be explored by using the "features" parameter, which looks at the various characteristics useful for project implementation, for example the graphic customisation, content creation tools, access levels and so on.

Looking at the "LMS features" more differences became apparent: Moodle and Dokeos were especially designed for collaborative environments, which became obvious in the evaluation. WBTServer offers a wide range of functionalities and flexibility. E-Logos as well as Sakai offer the functionalities of a forum and a chat but without the flexibility which Moodle has.

Concerning the "assessment design tools", E-logos showed significant technical deficiencies. The assessment and test-functions offered by Dokeos seem to be comparable with those offered by Moodle. Dokeos has an useful authoring tool (Oogie) to convert Word and Powerpoint documents into SCORM compliant courses. Comparing LMS about "administration tool" showed no significant differences.

#### 4.10. Summary Table

		Dokeos	Moodle	WBT Server	e-Logos
	Criteria weight	score	score	score	score
Standards	5	25	25	25	15



<b>Compliance</b>					
<b>Usability, User-friendliness, Multilingual Support</b>	4	20	12	16	16
<b>Developer Documentation, SDK, Community</b>	5	20	25	15	10
<b>Cost of Ownership and licensing</b>	3	15	15	6	6
<b>Scalability &amp; Security</b>	3	15	15	15	9
<b>Search Engine</b>	4	20	20	20	8
<b>Application Portability</b>	4	20	20	12	0
<b>Features</b>	3	15	15	15	9
<b>Total Score</b>		150	147	124	73

## 5. Conclusions and recommendations

As described above, the evaluation focussed mainly on open source platforms but also considered the commercial platforms WBTServer and e-Logos. Especially WBT Server offers a wide range of functionalities and seem to be a good solution but because of license and maintenance costs, the project team decided to exclude the commercial platforms WBT Server and e-Logos from the analysis.

Taking into account the specific differences of the systems and looking at the systems as a whole, both Moodle and Dokeos appear as good choices for BONY requirements.

Moodle has shown its strength in the communication sector for its diffused developers' community, but Dokeos is better for usability and authoring tools. Both systems appear to be secure, the installation is easy and the system works smoothly.

Concerning user-friendliness and usability characteristic the Learning Management System Dokeos is the best solution among the Open Source analyzed.

BONY project developers team suggest the adoption of Dokeos because its code appears to be clearer and simple, furthermore the team possess more usage skills over this LMS which can definitely grant overall project success.