Applications

eSCM: a web-based institute for sharing knowledge and competencies in the educational area of supply-chain management

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Abstract

The paper presents a web-based institute proposed for sharing knowledge
and integrating competencies in the educational area of supply-chain
management (SCM). The institute is being implemented as an Internet based
portal and addresses both students and teachers on university educational
level and employees in the industrial sphere. The methodology of the
institute as well as the web portal architecture, enabling the implementation
of the methodology, are presented. Thereafter, a demonstration of course
delivery in the e-learning environment of a virtual class is eventually
provided.

1. Introduction

According to EU documents, e-learning can be defined as follows: «the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration».

The definition may find application in 2 particular educational contexts: on university educational level and in a life learning scheme for employees in the industrial sphere (Ilie-Zudor et Al., 2005). This definition is, in fact, particularly consistent in the case of the employees, supposed to work in the context of an extended enterprise, where means of ICT integration are clearly required between collaborating enterprises, to enact collaboration in the day by day execution of the supply chain relationships (vendor managed inventory, continuous replenishment, etc.) as well as in processes situated at an higher level of supply chain tactical and strategic planning (collaborative forecast and production planning, collaborative product development, etc.). The adoption of e-learning tools in supply chains can be intended as another collaborative practice, selected by the extended enterprise in order to improve awareness of the supply chain relationships and cultural integration. When e-learning is applied in the context of improved remote exchanges on university educational level, the adoption of new multimedia technologies and the Internet may be intended in different ways. The main concern of this paper is that the e-learning serves to improve the collaboration between experts in the field of SCM, in order to develop a common knowledge library (common repository) where resources (materials to be learnt) may be accessed for course deliveries in diverse educational settings. Henceforth, e-learning is intended, by the authors, basically as an e-teaching method enabling the integration amongst educational partners coming from different real institutes. On the other hand, the use of e-learning for students is fostered in a more traditional way: the students may access the Internet resources as an aid to supplement and complete their face to face learning.

These two strategies — e-learning for employees in the industrial sphere and e-learning for teaching to students in diverse educational settings — are now being experimented in the framework of Leonardo da Vinci program, as a part of an international project funded by the European Union (project title: «An internet-based education/training platform in the field of supply-chain management, for students, teachers and industrial employees»; acronym: eSCM). This paper will present the e-learning methodology and the web portal features adopted to enable the e-learning for teaching to students in diverse educational settings (see sections 2, 3, 4 and 5). The common knowledge framework, achieved in the Consortium as a base ground for a common understanding and development of the materials to be learnt on SCM, is shortly presented (see section 6), together

with a description of the course delivery initiating from it. A demonstration of course delivery (section 7) is eventually shown, as a follow up of the knowledge framework commonly agreed.

2. The methodology

The e-learning methodology can be defined by considering the user profiles and their perspectives of the eSCM platform. Four user profiles have been defined for eSCM: student, teacher, content provider/editor and project worker.

(i)   the project worker is the specific profile adopted to carry out project task activities in industrial contexts (e-project section of the portal), it will be out of the paper scope;

(ii) teachers and content providers/editors are the actors required for the generation and organisation of the materials to be learnt (e-teaching section of the portal);

(iii) the e-learning tasks of students in eSCM (e-learning section of the portal) is eventually a follow up of the learning path built by their own teacher whilst organising the courses and composing the materials to be learnt therein. Besides lectures, some practical activities and games may be also organised in laboratories (Ilie-Zudor et al., 2005).

The figure 1 summarises the concept of the profiles in the eSCM platform.

Looking now more closely to the profiles of the content providers/editors and teachers, content providers/editors develop contents in a modular way and upload the materials to be learnt in a common repository of learning objects (eSCM content). Thereafter, teachers can develop and administer their own courses wherein to deliver the eSCM material to be learnt. The course development and administration is enabled with different types of flexibility offered by the platform.

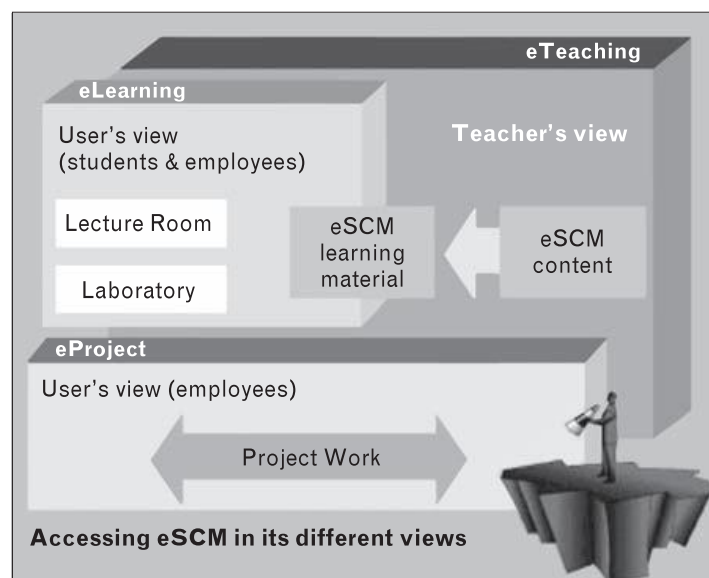(i)   Teachers may structure freely the contents of own courses

Figure 1   Accessing the eSCM platform in different profiles.

or inherit a structure of contents commonly agreed by the eSCM consortium in order to organise the SCM knowledge arena (flexibility of course organisation).

(ii) They may build own courses by assembling the learning objects already available in the eSCM common repository, upload own learning objects specifically developed for their course, or, eventually, adopt a mix of learning objects in between (flexibility of content composition).

(iii) They may administer the course delivery to students by means of a set of support services enabling communication (blackboard, agenda), interaction (forum, messenger, chat…) and testing activities with students (flexibility of course administration).

3. Teaching with different styles: a co-design approach

One of the most relevant key-point of the eSCM project is about different teaching styles to be used for selected target group of students. Different teaching styles are possible as a follow up of the flexibility offered by the eSCM platform.

In particular, the eSCM staff planned for two different learning scenarios, wherein to apply different styles. The first one (scenario A) is for students on university educational level, the second one is for employees in the industrial sphere (scenario B).

As far as the scenario A, an higher education courseware is made of sequential units to be learnt according to a step by step approach. The core elements of this approach are: teaching notes section and modules composed of a collection of learning objects. In teaching notes, students can have both a brief description of topics and format files associated, as shown, as an example given, in the following figure 2.

Figure 2 shows the teaching note of a course now active on the eSCM platform. The course is built up as a mix of learning objects, some developed for the course itself and others inherited from the eSCM common repository. The materials to be learnt (animated or not, integrated with voice or not, written in textual formats) is accessed in a sequential way by students.

As far as the scenario B, the materials to be learnt are more suitable for updating job competencies. Henceforth, more relevance should then be given to: case studies as learned lessons; simulations and role playing — that is: in different professional scenarios, problems to face are set-up and a solution is required similarly to what usually happens in the real work places —; emphasis to opinion leaders experience, in order to collect expertise and best practices in supply chain management.

In this scenario B, 2 case studies from industry (one in Italy and one in Rumania) are now being used as test benches. The case study from Italy, for example, is run in the context of a medium enterprise in the automotive sector and one of
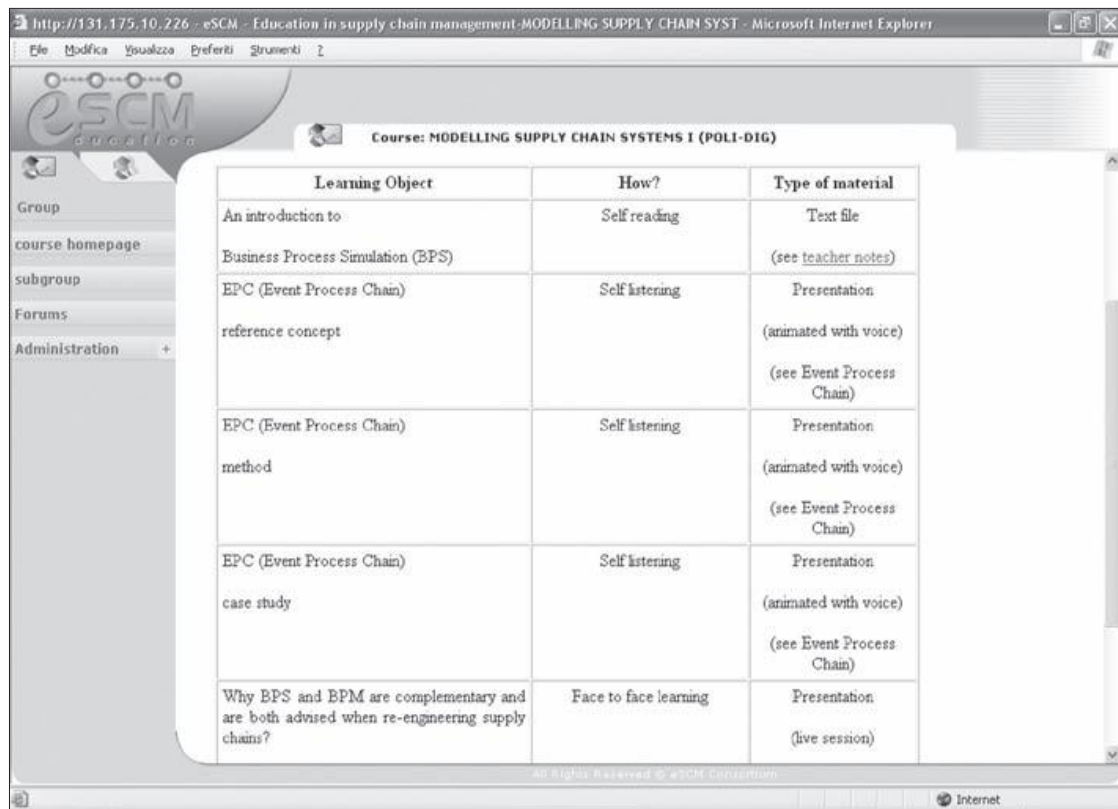
Sᴄᴇɴᴀʀɪᴏ A

Figure 2   An example of a teaching note developed according to Scenario A.

its supplier (small enterprise). The supplier will be involved in a simulation and role playing of the real activities that are usually done during its order fulfilment process. The role playing will allow to simulate existing practices and to prove some improvements of these practices. Indeed, the order fulfilment process is being integrated with some new collaborative activities (such as anticipating plans of order fulfilment based on capacity plans). The e-learning methodology will be an enabler to lead to a smooth change management.

In any case, either in scenario A or B, the instructional design and production of all materials to be learnt have to be tested and evaluated by users before their final release (co-design approach). To this end, the eSCM staff designed and realised a questionnaire as follow-up about:

- user-friendly functionalities and interface of the eSCM as learning environment;
- quality of materials to be learnt, edited as learning objects in the eSCM catalogue.

This questionnaire is composed by three main sections: user profile section, platform section and course materials section; in each section some items can be

found and selected with relative ranking scores; in addition to them, spaces for free comments/notes suggested by students are available.

The first outcomes of the questionnaire are very interesting. These outcomes regards, at this moment, only the scenario A, being the scenario B under development. In the context of this scenario, all the student testers, although they have different nationalities, education, language and culture, are suggesting similar improvements: they would like to have a more interactive materials to be learnt, that is they want some more learning activities to face as active players (simulations) and try all they need in very simple and quick manner.

In relation to these suggestions, the eSCM staff is effectively re-designing and implementing its own learning environment according to users supervision, who are getting co-designers involved in very useful way. The co-design approach seems again a result made possible by the flexibility of the eSCM platform. This, in fact, helps to plan for partial redesigns (for the platform and contents) according to the feedback from co-designers.

4. The web portal architecture

The eSCM platform has been developed in Java technology server side (Locatelli et al., 2001), following specifics of the standard J2EE (Java 2 Enterprise Edition). The adaptation to the standard J2EE allows that the platform is executed from any application server in compliance with the standard (from JRun to Bea Weblogic, from Tomcat to IBM WebSphere). This server side structure is supported by different browser platforms, therefore users can easily access the platform through Internet Explorer, Opera, Firefox by simply browsing www.e-scm.org. The architecture overview depicted in the following figure 3 is showing the four main parts of the platform:

(i)   the content editing side (up-left);
(ii) the learning management system (LMS) engine (up-central);
(iii) the administration side (down);
(iv) the user side (up-right).

The content editing side is the environment for content development. In the platform, it is possible to develop and publish two kinds of contents: structured and informal contents.

(i)   Structured contents are SCORM 1.2 compliant contents developed through a specific tool for content editing. In this project, the CMS (Content Management System) provided is Macromedia Breeze. This tool enables to start from a power point presentation in order to develop a multimedia learning object (LO). In order to be visualised and available in the common repository of the eSCM platform, the LO has to be finally uploaded by the system administrator.
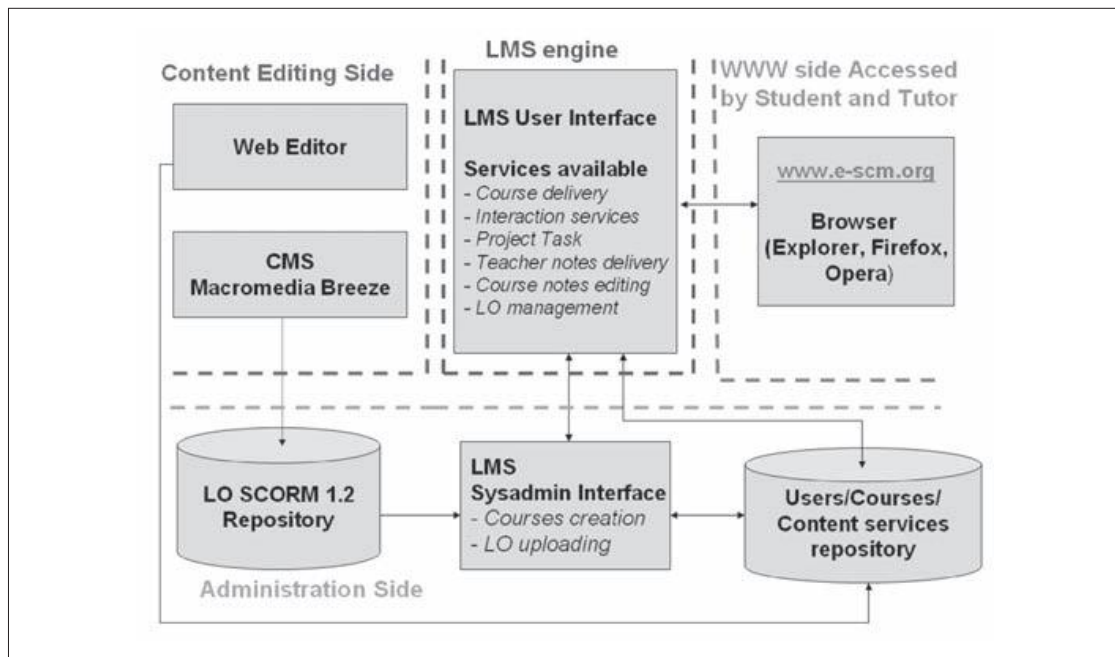
**Figure 3**   Architectural overview of the e-SCM web portal.

(ii) On the other hand, informal contents are normally uploaded directly by a teacher through a Web Editor interface. These contents are mainly constituted by different kinds of format like ppt., pdf., doc., xls. etc. and they are connected by means of a hyper textual interface created by the teacher him/herself.

The LMS engine is the core of the platform characterized by a collection of different interaction and communication services. This part is thoroughly described in the next section. The administration side plays a very important role for user, group, course creation and content management, in particular it allows the system administrator to upload the structured contents. This should be done only after a phase of quality review by the quality management team of the project. Eventually, the user side is the user interface delivered to students and teachers browsing the platform at www.e-scm.org. Each user is then provided with his/her username and password through a subscription procedure that is possible from the portal home page. After the login phase the user can customise his/her own profile and subscribe the different contents made available in the platform.

5. The learning management system

The LMS system is the engine of the web portal and it is constituted by a series of services allowing the community interaction and the content delivery to students.

The following figure 4 represents 2 captures where it is possible to identify the logical hierarchical structure of the LMS in terms of services. This hierarchy is structured in 2 levels. At the community level, users can access to a series of services in order to interact with the whole community. These services are forum, blackboard and chat. At the course/group level, users can adopt the same services only for interacting with the members of the same course/group which they belong to. Furthermore, users subscribed to a course/group can access the structured or informal contents associated to the course/group itself.
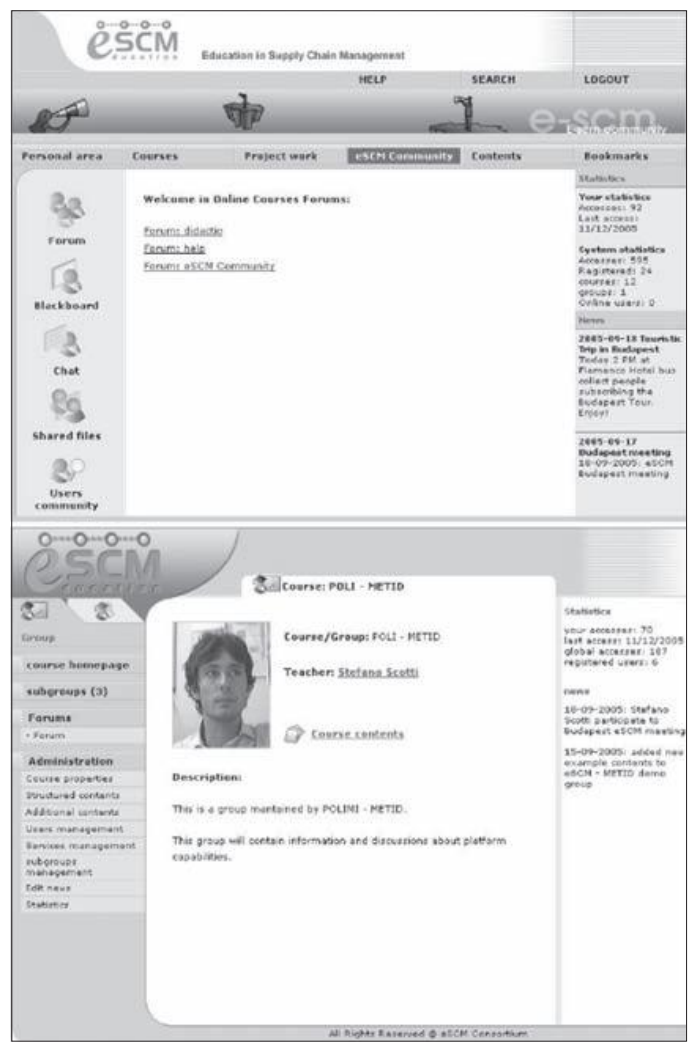
Figure 4   Community services (left capture) vs. course/ group services (right capture).

A series of other services are characterising the LMS. In particular:

(i)   a personal area where the user can modify his/her profile in terms of personal information like password, picture, address, etc.;

(ii) a table of structured contents available in the platform; in this table, a list of LOs is available and its described with information about the time of LO delivery and the author;

(iii) a frame containing general statistics on the use of platform and personal statistics;

(iv) a frame containing the latest news at the community and course/group level.

Eventually, some services are specifically provided to teachers for course delivery. In particular, some services allow a teacher to create the didactical structured and informal contents in the course. The Web Editor is, as said, the tool for editing the informal contents. It is connected directly with the course/group lead by the teacher, this allows to the teacher an easy and fast creation of informal didactical contents. Conversely, concerning the structured contents, the teacher can access an easy interface called Content Area. This is the common repository of LOs previously developed by the content providers/editors using Macromedia Breeze. In this Content Area, the teacher can select one or more LOs and create a didactical path that will be provided to all the users subscribed to the course/group that he/she is leading. Some other services allow to track the activities of the virtual classroom and the usage of the services by the students belonging to the course/group.

6. From the knowledge framework to the course delivery

The common repository of eSCM learning objects (LOs) is structured according to a list of topics of the materials to be learnt around SCM. The topics were defined after the achievement of a common understanding of the SCM scope and processes, tools and systems falling therein. This achievement was based on the consortium competencies over well known references from SCM literature Fox (Chionglo and Barbuceanu, 1993; Hieber, 2002; Supply Chain Council, 2006; Stadtler and Kilger, 2000). The short list of topics comprises the following items: fundamental issues in SCM, strategic planning, tactical planning, operations and execution, event management, network information management, collaboration methodologies, performance measurements and business process modelling.

An eSCM teacher may then exploit the LOs therein available for content composition: he/she may include them in the learning path designed in the context of his/her own course. He/she may also inherit directly the structure of the knowledge framework for his/her own course organisation.

7. A demonstration of course delivery

A demonstration of course delivery is hereby simulated by using the structured contents accessible from a teacher from his/her own course/group (Colorni et al., 2005). The attention is mainly paid on how it is flexible to organise a course for a

teacher by using structured contents previously built (through Macromedia Breeze). Once the teacher enters the Content Area, he/she is provided with the possibility to create folders and associate to the folders different LOs previously collected in the eSCM common repository.

By using a simple interface (see figure 5) the teacher can organise the course structure, adding folders, sub-folders and associate LOs to these folders.
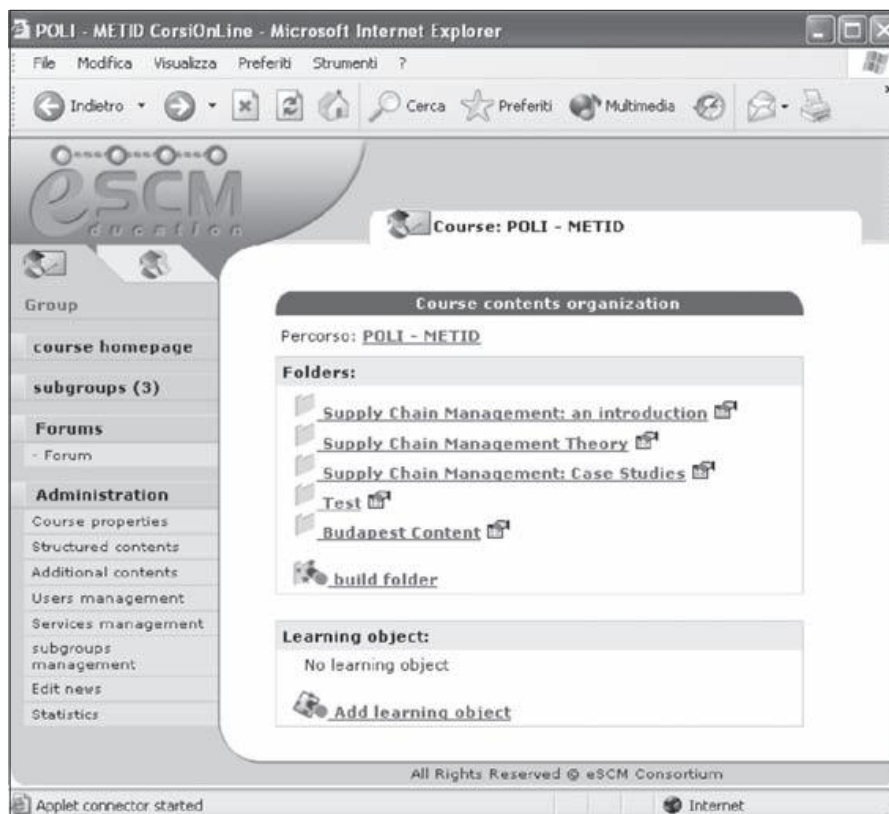

Figure 5 Defining the course structure – teacher interface.

The figure 6 is now representing the user interface provided to the student accessing the course. Therein, the student finds the structure created by the teacher. He/she finds it as a hierarchical structure of LOs created by the teacher according to a certain methodology (sequence) of contents required to achieve a determinate didactical path. By clicking on a single LO, the user is provided with a streaming of multimedia content with text, audio and animation (a capture of a demo is represented in figure 6).

8. Conclusions

The eSCM consortium is now developing the common repository of the eSCM platform. A set of learning objects is, in fact, being developed by each partner after
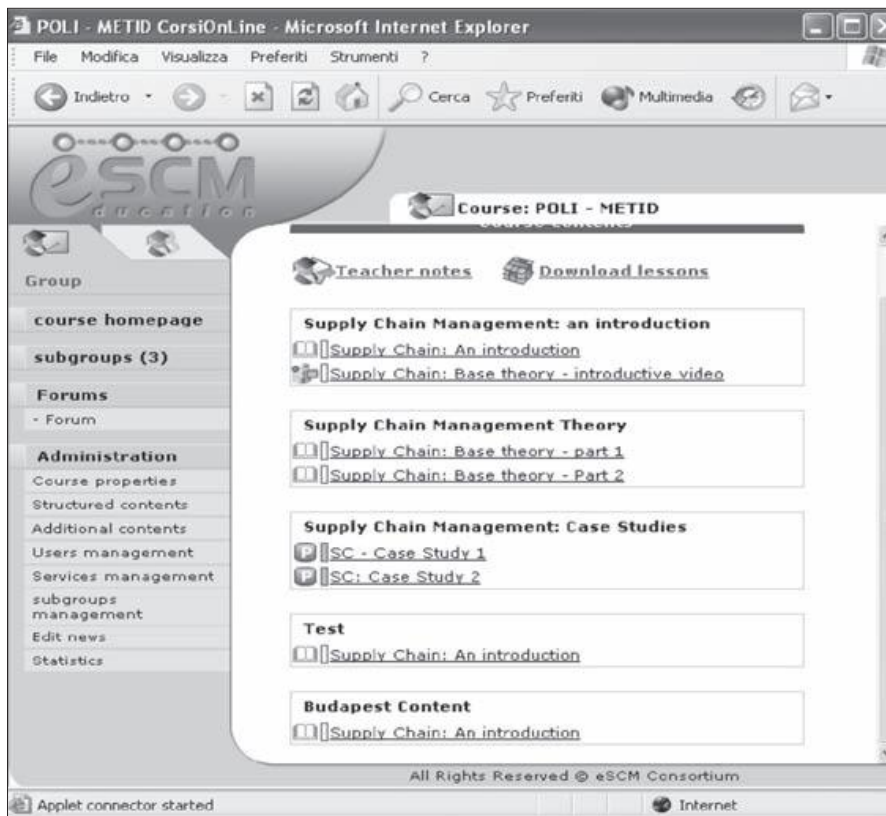
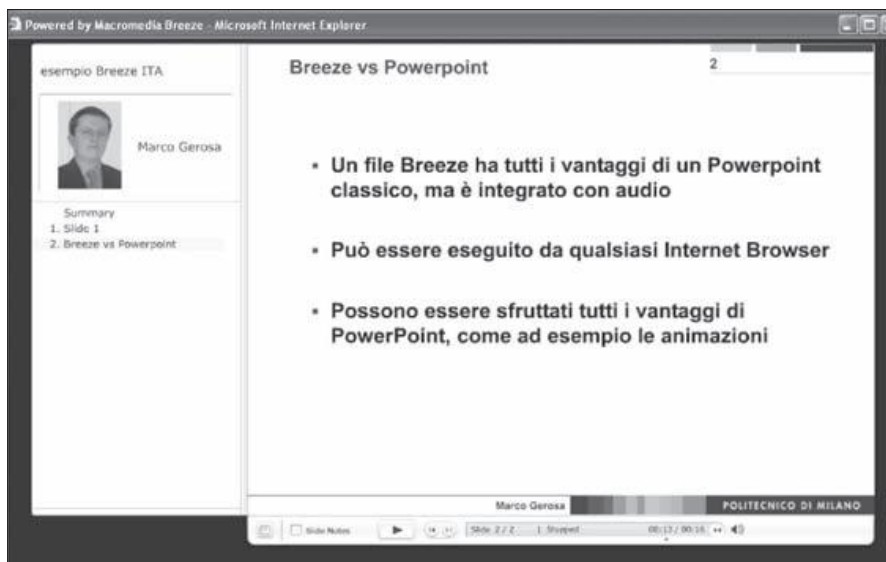**Figure 6** Accessing the LO in a course — student interface.

Figure 7 The LO interface provided to the user through multimedia streaming.

agreements regarding a standard format for learning objects. The testing phase with students on university educational level started since the first semester of 2006 and will end at the beginning of 2007. In the mean while, a parallel development and testing is planned in order to extend the knowledge sharing in industrial settings. Therein, the e-project section of the portal will be specifically adopted, to test, in project tasks, some targeted problems of co-operation and integration in supply chains. In this case, rather than a lecture or a gaming activity, which is the case of a course delivery to students, it will be adopted a more practical approach, in order to come close to the needs of the industrial practitioners of the e-learning tool. Simulation and role playing will be the main teaching style adopted to this end.

9. Further information about eSCM

The Consortium working on the eSCM project comprises five active partners and five so-called passive partners represented by small and medium-size enterprises contributing to the evaluation of the eSCM platform in their business context.

The active partners are the: Computer and Automation Research Institute, Hungarian Academy of Sciences (SZTAKI), Politecnico di Milano (POLIMI), Fraunhofer Institute for Manufacturing Engineering and Automation (IPA), University of Bergamo (UNIBG), Politehnica University of Bucharest (UPB).

The eSCM project is still ongoing; the development period of the project is of 30 months (October 2004 - March 2007). Responsibility for the information presented falls on the authors and not on the European Commission and the National Agency of the Leonardo da Vinci Program either. Further information on the project is available on the eSCM web portal at http://www.e-scm.org.

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