

# A NEW ETHOS FOR A MULTIPOLAR DESIGN LEARNING COMMUNITY: A MECHANISM FOR THE DEVELOPMENT AND DIFFUSION OF TEACHING MATERIALS ON DESIGN FOR SUSTAINABILITY IN AN OPEN-SOURCE AND COPY LEFT ETHOS

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## Abstract

Finally, the time has arrived in which there is a shared opinion that sustainable development requires a system discontinuity, meaning that radical changes in the way we produce, consume and socially interacts are needed. Finally, the time has arrived in which there is an emerging understanding that an important contribution to this change can be directly linked to the role of the design. However we have to admit that the designers are still more part of the problem, than part of the solution, i.e. proactive and diffused actors of the radical change requested by the transition towards a sustainable society. Within the so called learning society, new visions and tools are urgently requested for the design. A new political agenda is needed, looking at all of the of the design's bodies (the designers, the design educators and the design researchers) as a learning community that urgently needs to accelerate the process of consolidation and diffusion of the new knowledge and know-how, for a new generation of designers. Under this perspective, a key role should be played by the design schools. The paper will explore this issue and in its framework presents the vision, the ambitions and the tools developed within the Learning Network on Sustainability (LeNS) project, an Asian-European multi-polar network for curricula development on Design for Sustainability, financed by the European Commission under the Asia-Links programme.

**Keywords** - learning network; sustainability; didactic materials and tools; learning objects; e-learning; collaborative knowledge production; open-source; copy left; design for sustainability; product-service system; PSS.

## 1 SUSTAINABILITY IN DESIGN: NOW

It is widely shared that sustainable development requires a system discontinuity, meaning that radical changes in the way we produce and consume are needed.

In the second half of the '90s a series of studies and analyses led to a clearer understanding of the dimension of change necessary to achieve a society that is effectively and globally sustainable. It was then realised that conditions for sustainability can only be achieved by drastically reducing the consumption of environmental resources compared to the average consumption by mature industrialised contexts. The debate about more sustainable consumption patterns has been included in the agenda of the major international governmental institutions over recent years starting with the United Nations. Particularly significant was the setting up of the Sustainable Consumption Unit of the UNEP (United Nation Environmental Programme) in May 2000. The initial assumption was that "in spite of the progress made by the industrial world and enterprise during the last decade [...] the extent to which consumption exceeds the Earth's capacity to supply resources and absorb waste and emissions is still dramatically evident" [1].

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<sup>1</sup> The paper is the result of the collaboration between the two authors; nevertheless Vezzoli wrote sections 1, 2 and 5; Ceschin wrote sections 3 and 4.

Some studies (taking into account demographic growth forecasts and hypothesising, rightly, an increase in the demand for well-being in currently disadvantaged contexts) have brought out a staggering result: conditions for sustainability are achievable only by increasing the eco-efficiency of the production-consumption system by at least ten times. In other words we can only consider sustainable those socio-technical systems whose use of environmental resources per unit of satisfaction/service is at least 90% less than what is currently done in mature industrial contexts [2] [3] [4]. These estimates are approximate and currently under scientific discussion. However, they are still valid to indicate the proportions of the change that should take place. A profound, radical transformation in our development model is necessary and the production and consumption system in this sustainable society will be profoundly different from what we have seen up to now.

The radical reduction of resources consumption and emissions in industrialized (and emerging) contexts, will require a shift from an idea of a society where well-being and economic health are measured in terms of growth in production and material consumption, to a society where people are able to live better consuming far less, and to develop the economy reducing the production of material products. At the same time the socio-ethical challenges will require a diffused increase of well-being in low-income (and emerging) contexts.

Given the nature and the dimension of this change, we have to see transition towards sustainability (and, in particular, towards sustainable ways of living) as a *wide-reaching social learning process* in which a *system discontinuity* is needed. Therefore a system approach is important in order to seriously tackle the transition towards sustainability.

Within this framework, what role for *Design for Sustainability*? Along the last decades the role of design has in fact increased in relevance and recognition, and the approach of *Design for Sustainability (DfS)* has been evolving in research and has started to be recognised in many parts of the world. The following text synthetically describes how the research on this discipline has enlarged its scope and field of action over time, as observed by various authors [5] [6] [7].

A first level on which numerous theorists and academics have been working is the **selection of resources (materials and energies) with low environmental impact**. The focus was on the toxicity, harmfulness, recyclability, biodegradability and renewability of materials and energies.

Since the second half of the nineties, attention has partially moved to the product level, in particular to the **design of products with low environmental impact**, usually referred as product Life Cycle Design or Ecodesign or Design for Environment [8] [9] [10] [11] [12] [13] [14]. In those years it became clear how to assess the environmental impacts related to a product, and how to design products with a lower environmental impact. In particular two main concepts were introduced. Firstly, the concept of *life cycle thinking*: it is not the single product to be designed (and environmentally assessed) but all the processes needed to produce the materials and components, assembly the product, distribute it, use it and finally dispose it. Secondly, the concept of *functional thinking*: it is not the single product to be designed (and environmentally assessed), but the function delivered by the product itself.

Over the last few years, starting with a more stringent interpretation of sustainability (that tells us that radical changes in the production and consumption system are needed), attention has partially moved to **design for eco-efficient system innovations**, therefore to a wider dimension than that of the single product [15] [16] [17] [6] [18] [19] [20] [21]. Within the wide debate on the definition of system innovation, design researchers have usually referred to the so called Product-Service System. Among the several converging definitions the one given by the United Nations Environment Programme [20] says that a system innovation (referred to as Product-Service System, PSS) is “the result of an innovative strategy that shifts the centre of business from the design and sale of (physical) products alone, to the offer of products and services that are together able to satisfy a particular demand”.

Still more recently, design research has opened discussion on a possible role of **design for social equity and cohesion** [22] [23] [24] [25] [26] [27] [21]. Hence, a potential role for a design directly addressing various aspects of social equity and cohesion, aiming at a “just society with respect for fundamental rights and cultural diversity that creates equal opportunities and combats discrimination in all its forms” [28].

In synthesis it is possible to say that there is an emerging understanding that an important contribution to sustainability can be directly linked to the role of *design*. However, despite the development made DfS research, we have to admit that designers are still more part of the problem, than part of the solution, i.e. with some exceptions they are not proactive and diffused actors contributing to the radical change requested by the transition towards a sustainable society. We can observe that the design is

moving too slowly and without effective results in terms of its impact on the re-orientation of the overall system of production and consumption.

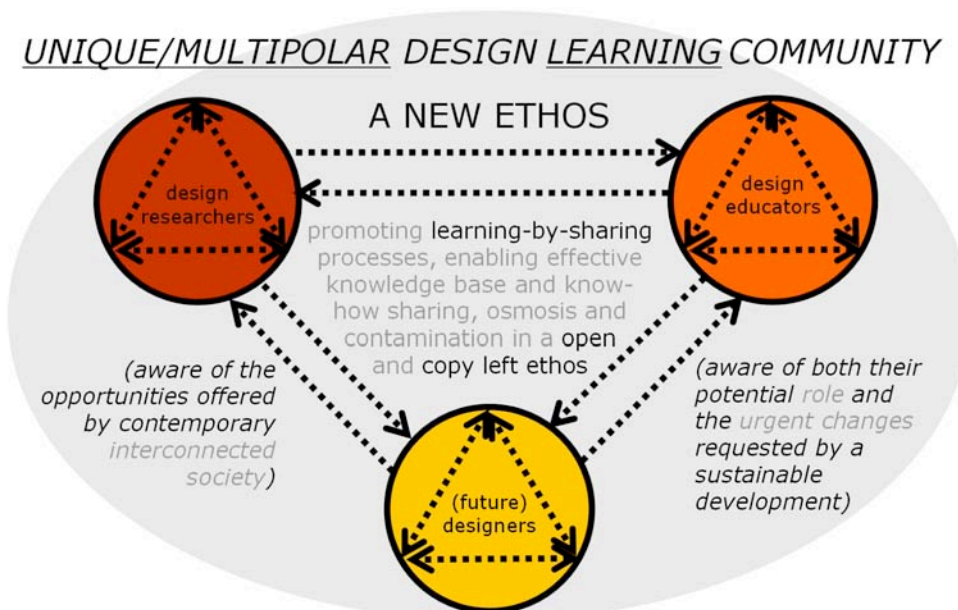
Industrial design, in its relatively young history, has usually been very sensible to the emerging socio-technical opportunities and challenges, but for what concern sustainability it seems to be too “shy”, far from seriously tackling its issues. We can observe within design some incremental improvements in the understanding of this role and in the subsequent actions taken. Nevertheless it is still a tremendously too weak response to the challenge posed given to the potential role the designers may play. It is important to note that many designers are still unaware of sustainability basic knowledge, criteria, as well as available design methods and tools; so forth they contribute to increase negative impact by designing products and or services with a high environmental impact.

Furthermore, designers have a role in giving an appeal to new products, services or systems; a role in defining the success of the whole communication apparatus linked to the launch of a new artefact into the market. In other terms they may give a contribution in influencing sustainable as well as unsustainable acquisition of artefacts, and, behind this, sustainable as well as unsustainable consumption patterns. When speaking about unsustainable consumption in industrialised contexts, many designers play a role, within the wider economical model that foster consumerism, when they support the launch of products and services on the market, which are of high environmental impact, e.g. culturally or aesthetically obsolescent products, products designed to have a short lifespan. This negative contribution to sustainable consumption is often amplified by other communication and brand mechanisms, with the result of enhancing unsustainable user behaviours.

Research and academic institutions in the last years have produced knowledge and know-how (methods and tools) on DfS, and these knowledge and know-how is therefore (even thought with different level of consolidation), available. Hence the design community has not excuses, and must start acting now to effectively disseminate and share the needed knowledge and know-how. A new ethos for knowledge building and sharing is urgently required.

## 2 A NEW ETHOS FOR KNOWLEDGE BUILDING AND SHARING

Within the so called *learning society*, given the radical changes required by sustainability, it seems strategically important to introduce the perspective of design as a *unique learning community* (see fig.1), to emphasize the importance of knowledge sharing throughout effective interactions among the different bodies of design: *designers*, *design educators* and *design researchers*. A design learning community that should aim at speeding up the building of a new generation of designers aware of their potentials and capable of designing within a new paradigm, necessarily different from the one they are use to act in nowadays.



**Figure 1.** Unique multipolar design learning community. Interactions among the different bodies of design: designers, design educators and design researchers.

New visions and tools are therefore urgently requested by this design learning community. In fact, a new political agenda for sustainability is needed, looking at all of the of the design's bodies as a learning community that urgently needs to accelerate the process of consolidation and diffusion of the required knowledge and know-how, for a new generation of designers.

Within this path to be followed, there is a growing opinion that design Higher Education Institutions (HEIs), could have a key role to play, being the places where research and education converge (or should converge). There is a pressing need of new opportunities enabling design educators and researchers to share knowledge in this field and come out with a design education agenda able to respond both to local and global sustainable development issues. The design schools (design researchers/educators), should rethink themselves as places for advanced research and education, as well as diffusers of sustainable visions and ideas; and need to be able to equip design students as well as designers with the new knowledge base, as well as effective methods and tools so a new generation of designers can play an active role within the transformation of our consumption and production patterns.

Under this perspective, there is a pressing need of “mechanisms” that act at the research and education level (and in their interactions), enabling design researchers and educators in industrialized, emerging and low-income contexts to speeding up the knowledge sharing in this field and come out with a design research and education agenda able to respond both to local and global sustainable development issues.

Innovative knowledge sharing design learning communities should be envisioned; new alliances (innovative networks) based on the opportunities offered by the contemporary rapidly changing society is there to take place.

Within this scope it is operating the ongoing **Learning Network on Sustainability (LeNS)** project (2007-2010), an Asian-European multi-polar network for curricula development on *Design for Sustainability (DfS)* focused on Product-Service System innovation, financed by the European Commission under the Asia-Links programme. LeNS is an action of curriculum development in the field of Design for Sustainability and Product-Service System (PSS) innovation design. Its starting point is that a new generation of designers should be formed with the right conceptual and operative tools to be able to contribute to the transition towards a sustainable society. For that, design educators across regions should be able to create and incorporate new learning resources into existent or new curricula. In the LeNS project, the focus is on Europe and Asia, but its ambition is to reach worldwide design educators and HEIs through the production of outputs in a copy left model<sup>2</sup>.

The main output of the project will be the so called **Open Learning E-Package (OLEP)**, an open web platform that allows a decentralised and collaborative production and fruition of knowledge. It can be described as a modular e-package of teaching materials (slide shows, texts, audio, video, etc.) and tools for designers, that design researchers/educators (as well as students, designers, entrepreneurs and interested persons/institutions) worldwide will be able to download (free of charge), modify, remix and reuse (in a copy left logic).

Apart from the contents, the same OLEP platform is realised in an open-source and copy left logic, allowing its download and reconfiguration in relation to specific needs, areas of interest and themes.

In other words the LeNS project has the ambition of being a catalyser for actions and exchanges on education (and research) in design for sustainability worldwide, through the production of the previously mentioned Open Learning E-Package (see section 3), and a replicable web-platform to be easily reproduced in a worldwide scale (see section 4).

### **3 LENS MAIN RESULT: THE OPEN LEARNING E-PACKAGE (OLEP)**

As said before the OLEP can be described as an e-package composed of a set of modular learning resources targeted at design educators, to facilitate the activation and implementation of courses on Design for Sustainability (DfS) with a focus on sustainable Product Service Systems innovations. The learning resources of the OLEP will be easily to be used and free, being based on an open-source and copy left logic: teachers (as first intermediate learners) can download, modify and reuse the available set of learning resources. The OLEP is obviously targeted even at students, and other professionals

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<sup>2</sup> For a detailed description of the process and the approach adepte within the LeNS project see [29] and [30].

for their continuous education such as designers, entrepreneurs and interested persons/institutions. The OLEP will be located within the LeNS web platform ([www.lens.polimi.it](http://www.lens.polimi.it)). The following text will focus on the technical details of the OLEP.

### 3.1 Generation and acquisition of contents

The open learning e-package contents are produced during the LeNS project by the partners' teachers, but can incorporate other existent or future materials considered as interesting and relevant. The teaching materials will be developed based upon the identified needs. They will be also partly based upon the teaching materials of the partner institutions developed prior to the LeNS project, as well as new teaching materials to be developed ex-novo. Each topic will be covered by a range of different supporting media.

Next to the teaching materials developed and collected in the preparatory phase, the core of the OLEP will be constituted by the materials used in (selected to/developed for) the pilot courses (the project in fact foresees the implementation of 8 pilot courses on DfS). In practice, in each pilot courses it will be developed: a programme for the course; a series of slideshow presentations to support the lecture; a series of related video-recorded lectures. Each partner preparing a new pilot course will use the OLEP so far produced, and so will make use of what has been produced in the previously courses. After the implementation of each of the 8 pilot courses, an evaluation will be carried out (based on the observers report) to assess the impact of each of the teaching materials used. This assessment will inform the teachers of the next pilot courses as well as the progressive development of the OLEP final version (indicating for example if a given learning resource needs to be adjusted, materials that work better in a given context, etc).

### 3.2 OLEP general requirements

In practice, the open learning e-package contents will be:

- *Indications, guidelines and examples of courses* (programmes, supporting materials, expected results, etc) targeting teachers who wish to activate new courses or renew existing ones on system design for sustainability (incorporating it on the school/university curricula)
- *Materials* (slideshow; slideshow + video recorded lecture; slideshow + audio recorded lecture; video; text; or other formats), and tools to support teachers in holding courses and didactic modules, on system design for sustainability.
- *Materials* (slideshow; slideshow + video recorded lecture; slideshow + audio recorded lecture; video; text; or other formats), and tools to support students who follow courses on system design for sustainability.
- *Materials and tools* to support *designers* in incorporating DfS thinking into their practices.

The OLEP is meant as a modular package of learning modular resources. Any interested design teacher is allowed to: download, modify/remix and reuse. The aim is to allow any design teacher to adapt and use the learning resources he/she finds useful, according to his/her specific didactic needs, institutional requirements or local context particularities. Also students and designers are welcomed to access the OLEP to support their learning activities (linked or not to a given course).

The OLEP contents will take different formats: *texts; slideshow presentations;* composed presentations that integrate *video-recorded lectures with slideshow presentations; audio or audio/video* files (e.g. recorded lectures); *software* and other *tools; archives and databases of best practices, examples,* etc. All e-package contents are characterised by: *being downloadable for free (free-access); having a modular structure;* being developed with an *open-source and copy left* ethos, with intellectual property rights (authorship), but without restrictions to diffusion (i.e. Creative Commons license).

### 3.3 OLEP functionalities

Learning resources can be accessed as single objects or grouped objects (as related to a particular course/teacher). More precisely two modalities of access have been so far identified: 1. access to all learning resources of a particular course/teacher; and 2. access by content to single learning resources (regardless the teacher/course). In relation to the upload of learning resources, two

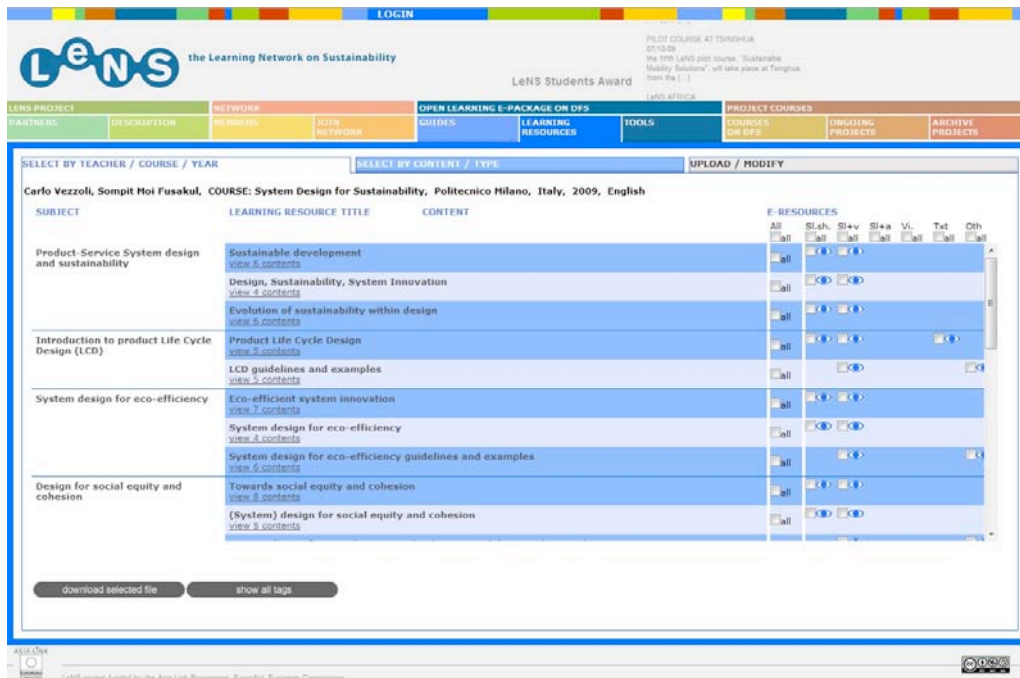
modalities have been defined: 1. upload/modify learning resources related to a particular course (learning collection); 2. upload/modify single learning resources.

**A. DOWNLOAD/VIEW - Access to all learning resources of a particular course/teacher**

Users can search for a particular course (fig. 2), visualize its structure and organization and get access (visualisation and download) to all the learning resources (fig. 3).



**Figure 2. SELECT BY COURSE/TEACHER** - User selects the desired language and gets access to a list of courses; these courses can be ordered by teacher, course name, learning hours, year, institution and country; user selects the desired course and gets access (fig. 3) to its organization and contents.



**Figure 3. SELECT BY COURSE/TEACHER** - User visualises the structure of the course: which are the Learning Subjects (LS) and which are the Learning Resource (LR) titles grouped under each LS. For each LR titles (which are described by a set of contents), it is possible to see which are the LRs uploaded. These LRs are ordered in relation to the type of format (slideshow, slideshow+video, slideshow+audio, video, text, or other). It is possible to visualise them (clicking on the “eye” icon), or download the selected ones.

This functionality is especially thought for:

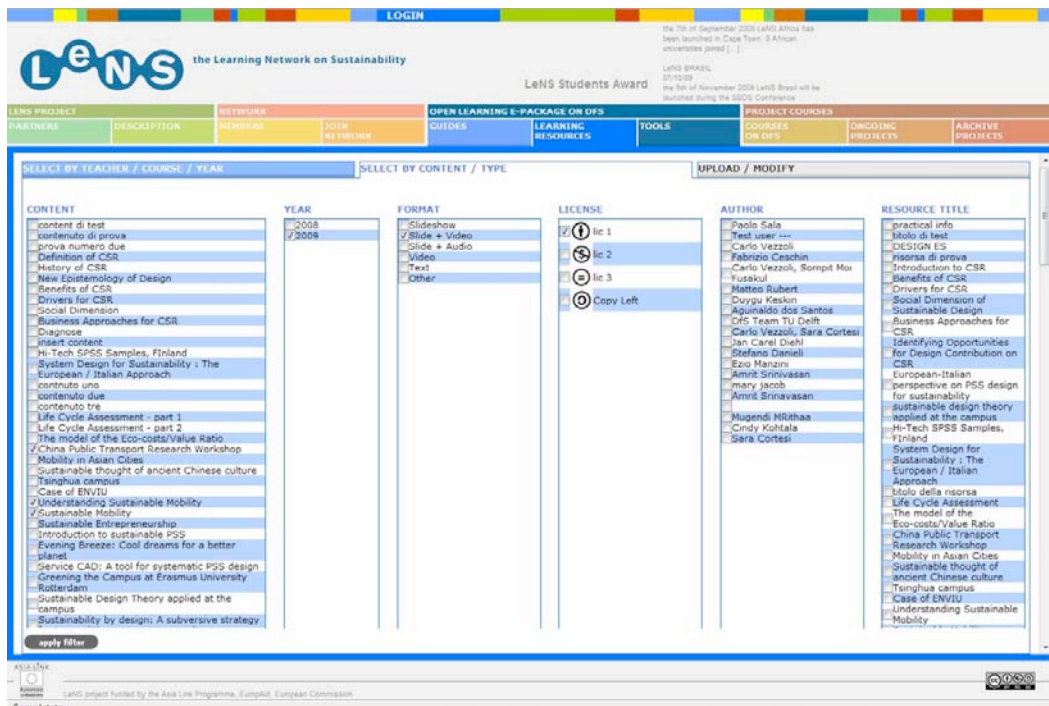
- teachers who want to start a course on DfS focused on PSS from the beginning and thus could be interested in an overview of the organisation of all the contents within a course, and searching for appropriate learning resources to download, modify, integrate and reuse;
- students who want to receive support for the course they are following, could have all the related learning resources gathered.

### B. DOWNLOAD/VIEW – Access by contents to single learning resources

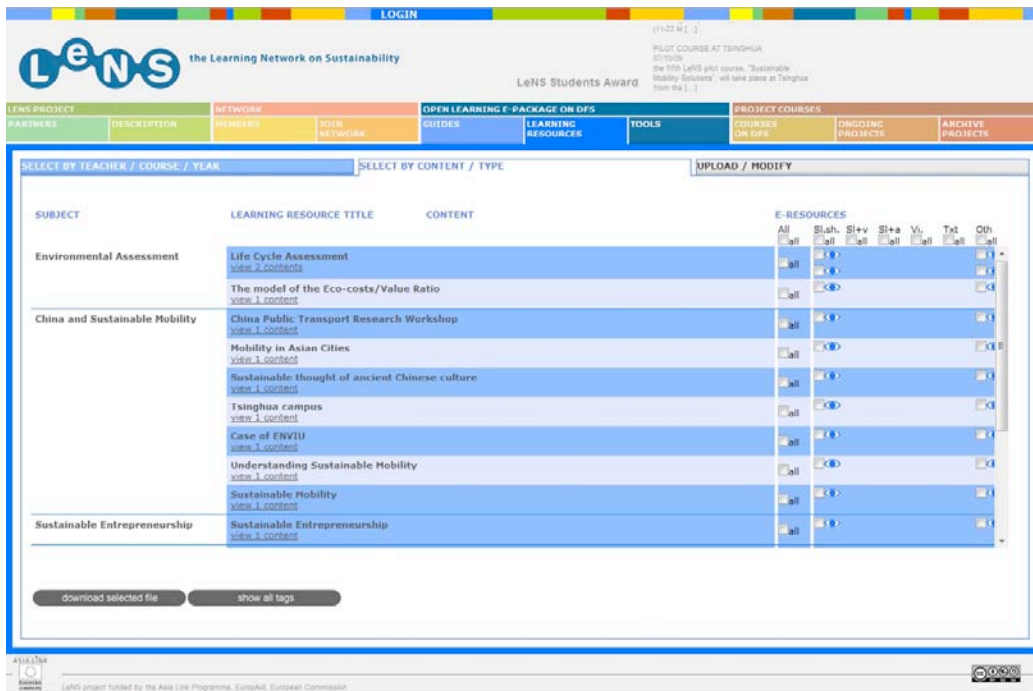
Users can search for particular learning resources through a research by contents (fig. 4), get access (visualisation and download) to all the related learning resources (fig. 5).

This functionality is especially thought for:

- teachers who wants to improve a course on DfS and thus can get direct access to all the materials that has been produced/collected related to a specific issue.
- students who wants to deepen a certain issue/theme and thus can get direct access to all the materials related to it, independently from teacher's indications.



**Figure 4. SELECT BY CONTENT** - In the first five columns user can search respectively by content, year, type of license, and author; the column in which user operates works as filter for the others (e.g. if you click on a specific author you will see only the contents associated to him/her). The last column visualises the result of the research: a list of Learning Resources. At this point user can select the LRs he/she wants to visualise, and click on “view/download”.

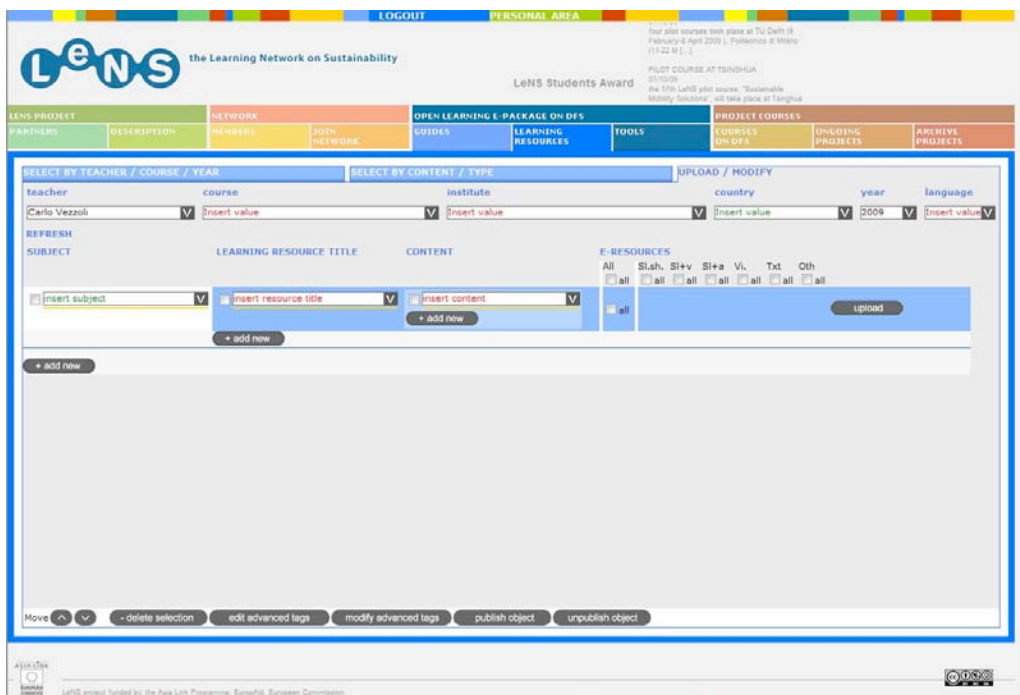


**Figure 5.** SELECT BY CONTENT - User visualises the Learning Resource previously selected. These LR are ordered in relation to the type of format (slideshow, slideshow+video, slideshow+audio, video, text, or other). It is possible to visualise them (clicking on the “eye” icon), or download the selected ones.

**C. UPLOAD/MODIFY – Upload/modify learning resources related to a particular course/learning collection**

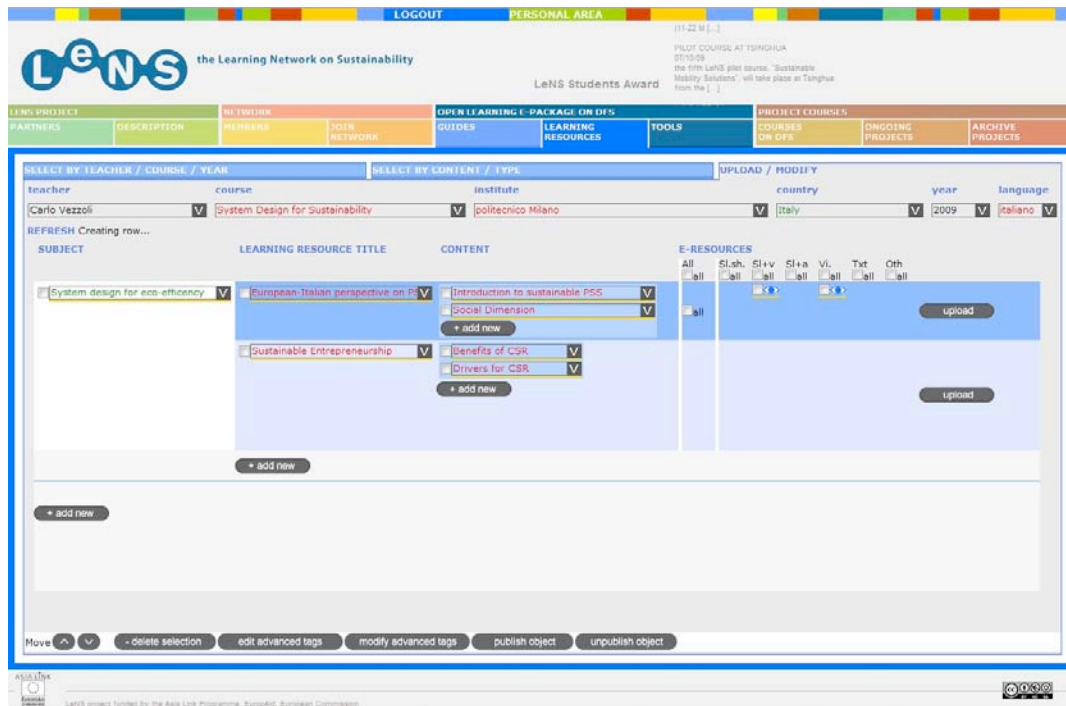
Teachers who are part of the LeNS consortium will be able to update the e-package during and after the project. They represent the OLEP scientific board, which will control the e-package updating, safeguarding the scientific reliability of the new materials. External teachers and users of OLEP will be enabled in uploading learning resources only if the scientific board allows them. To upload a new course (learning collection), user enters in the “upload/modify” area (fig. 6), sets up th

e structure of the course (defining the Learning subjects and related Learning Resource titles), and, within each LR title, uploads the related LRs (fig. 7).





**Figure 6.** UPLOAD/MODIFY – After entering the “upload/modify” section, user can see in the upper part of the interface all the information related to his/her course; some of these information are automatically assigned by the system (but can be changed), while some others have to be inserted by the user (e.g. course name). Below this information there are 4 main columns: subject, learning resource title, content, and e-resources. User can operate in this area building up the structure of his/her course: he can add subjects, and under each of them add the related LR titles.



**Figure 7.** UPLOAD/MODIFY – User builds up the course structure and for each Learning Resource title uploads the related Learning Resources. LRs are ordered in the last column in relation to the type of format: slideshow, slideshow+video, slideshow+audio, video, text, or other. During these operations he/she can: modify the order of the LS and LR title, delete LS and LR titles, add/modify LRs metadata. After that he/she can publish the course, to make it visible and downloadable.

As said before users have also the possibility to upload single learning resources; in this case the procedure is similar to the one that has been just described.

#### 4 LENS AS A REPLICABLE WEB-PLATFORM

A free-access, open-source, copy left and modular learning model like the one proposed by LeNS, is characterised by presenting opportunities (it facilitates: knowledge dissemination, knowledge upgrade; knowledge adaptation in relation to different contexts/learners; collaboration between researchers and teachers), but also threats (problems related to the scientific reliability and the dispersion of knowledge)<sup>3</sup>. LeNS approach has been targeted at safeguarding opportunities and at the same time reducing/avoiding threats. For this reason it has been decided to develop a regenerative, “replicable” web platform. In other words not only the contents, but the same LeNS web-platform is downloadable as open-source and copy left artefact:

- any educational institution, teacher, sustainability-focused network, can generate a new LeNS-based web-platform, reconfiguring it by re-defining partners (the scientific board), the sustainability focus, the geographical representation;
- any new generated web-platform will upload and manage learning resources independently (controlling also the scientific reliability);
- any new generated web-platform will be linked to the others.

In other words the LeNS web-platform is intended as a true open source artefact. It is realised in an open-source and copy left logic, allowing its download and reconfiguration in relation to specific needs, area of interest and geographic representation.

<sup>3</sup> For a detailed description of the opportunities and threats of this learning model see [30].

A proliferation of locally/content-based interconnected networks of design communities is in this way supported (and promoted). Within this perspective we see the launch, in September 2009, of LeNS Africa<sup>4</sup> [31], and the launch, in November 2009, of LeNS South America<sup>5</sup> (other launches are under definition, e.g. in the United Kingdom and in Japan).

Each of these affiliated networks will be linked with each other in a multi-polar structure, so forth being at the same time independent and focused on specific needs and themes (for example the South American network will focus on design for sustainability in emerging contexts). In relation to the scientific reliability of the uploaded materials, each “affiliated” network will be responsible of controlling the scientific quality of what will be produced.

## 5 LENS PROJECT AND ITS IMPLICATIONS FOR RESEARCH, EDUCATION, PRACTICE AND SOCIETY

LeNS aims at becoming a mechanism for the development and diffusion of system design for sustainability in design universities and schools. It appears to us that this is proposed in the right moment, when sustainability is being incorporated in the worldwide agenda, and in all levels there is a clear perceived growing demand of design for sustainability. It appears also that it is the right opportunity, of interfering at the education level, since education is very much the base of every change.

Within this framework LeNS ambitions to offer an open output, a free-access, open-source, and modular-content web-platform for storing and sharing knowledge (learning resources in design for sustainability, courses, guide-lines and examples, teaching materials, methods, tools, presented through different supports texts, slide presentations, video, audio, etc) among design educators, students and practitioners. It is intended also as a reproducible platform, allowing interested users to reproduce its architecture in localized versions, in different languages or focused on specific regions or themes.

In other words the LeNS web-platform is characterised by being open (because its contents are freely available for teachers, students, designer, companies and interested persons), multi-polar (because teachers from all over the world can contribute to the contents development bringing their own inputs and perspectives), interconnected (because there is a continuous exchange and sharing of contents and didactic materials), and regenerative (because the same web-platform can be downloaded and reconfigured in relation to specific needs).

Within this perspective, which are the LeNS project implications for research, education, practice and society?

LeNS allows a process of mutual learning, facilitating a readily access, exchange, review and update of knowledge. In this sense LeNS is intended as a sort of cross-learning mechanism among design researchers and educators, in which each of them can learn from each other. For this reason LeNS can potentially speed up the achievement of **research** results on the one hand, and their dissemination on the other.

If research results are readily disseminated and shared between researchers and teachers, it is clear that, as a consequence, there could be an improvement in the quality of **education**. In fact, through the LeNS web-platform, research results can be translated “just-in-time” in teaching materials freely available all over the world. Moreover it has to be underlined that LeNS not only allows to share teaching contents, but also teaching views and approaches. In this way design educators can learn from each other also in terms of teaching modalities.

An improvement in the quality of education will of course benefit design students, which can be formed with the right conceptual and operative tools to be able to design sustainable products,

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<sup>4</sup> LeNS Africa was officially launched the 7th of September 2009 by prof. Johannes Cronjé, Dean of Faculty of Informatics & Design (Cape Peninsula University of Technology).

<sup>5</sup> LeNS South America was officially launched by Professor Aguinaldo dos Santos (Universidade Federal do Paraná, Lens coordinator, UFPR, Brasil) jointly with Professor Carlo Vezzoli (Lens coordinator, Politecnico di Milano, Italy), at Universidade Anhembi Morumbi in the presence of a number of partners, including the leader of the LeNS Africa (Prof. Dr. Mugendi M'Rithaa – Cape Peninsula University of Technology – South Africa), and one of the partners of LeNS Europe (Prof. Dr. J.C. Diehl – Delft University - Holland).

services and system organisations. And today's students will be the designers of the future. In this sense design consultancies and company design departments will benefit from better-qualified design graduates. In other words LeNS project will potentially bring improvements, in the medium/long term, also to design **practice**.

For this reason in the long term there could be a contribution in creating and disseminating innovative and sustainable solutions. In particular the dissemination of sustainable Product-Service System (PSS) concept offers a great potential as a promising entrepreneurial model potentially capable to facilitate the process of socio-economical sustainable development (see section 1). In this sense LeNS, fostering a new generation of design researchers and educators, aims at promoting a new generation of designers effectively capable to have a role as catalysers and enablers of the transformation of our consumption and production patterns, with consequent positive implications for the whole **society**.

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