

# Implementation of Social and Semantic Tools into Open Educational Resources Production

Samanta Cueva Carrión

Instituto de Investigaciones en Ingeniería y Ciencias de la  
Computación – Gestión del Conocimiento  
Universidad Técnica Particular de Loja UTPL  
Loja, Ecuador  
spcueva@utpl.edu.ec

Germania Rodríguez Morales

Instituto de Investigaciones en Ingeniería y Ciencias de la  
Computación – Gestión del Conocimiento  
Universidad Técnica Particular de Loja UTPL  
Loja, Ecuador  
grrodriguez@utpl.edu.ec

Edmundo Tóvar Caro

Facultad de Informática  
Universidad Politécnica de Madrid  
Madrid, España  
edmundo.tovar@upm.es

**Abstract**—The present paper shows the Word made to implement of one production cycle of OERs using Social and Semantic Resources into an OCW repository of a high level educational institution which has allowed to prove the proposal of OER's production cycle based on ADDIE instruction design model.

**Keywords**—component; Open Educational Resources, Social Tools, Semantic Web, production cycle, Open Course Ware.

## INTRODUCTION

An Open Educational Resource (OER), is digital content accessible from web repositories, the usage of OER's in third level education is a unique opportunity to fair social information access, application and generation of knowledge.

The present work shows the results of a whole OER production cycle which includes social components and semantic web; based on the model of instructional design ADDIE. The implementation tests have been applied in the OCW repository of a university.

The results gotten with the implementation of this OER production life cycle are: the collaborative construction of the resources of the teachers' intervention (experts), students (users) and technical staff; conformation of virtual communities; search optimization, identification and spreading of these resources; and time improving OER's production.

It is important to mention that this production cycle can be used by other third level institutions with certain modification to the publicity policies depending on the particular legal background.

## OPEN EDUCATIONAL RESOURCES

William and Flora Hewlett Foundation has supported a large number of projects on this area, cause of their great potential and contribution to educational development. Considering that there is a wide amount of educational material available on the web, but poorly organized so, it is not contributing to a quality education, there has been created projects such OpenCourseWare (OCW); being the Massachusetts Technology Institute (MIT) who first launched the OCW in 2001, offering full courses with their tutorials which are developed and used by their teachers in class, currently a lot of universities have joined this idea setting these materials online for massive access.

OER'S on the Web, are involved in the purpose of Semantic Web giving meaning to all kinds of Web available information. According to [2]; Semantic Web offers many possibilities focused on development:

1. Make it easy the search and storing of local and global data bases, having semantic information (metadata) to help their discovery and reuse.
2. Help the use of ontologies which highlight the resource structure to be assigned pedagogic meaning, and;
3. Power personalization of educational contents and resource development to assist user in making significant tasks in Semantic Web.

Monge and Ovelar [3] propose 6 technologies which can be implemented in order to support social dynamics in the repositories: understandable auditory identification systems and usage license; fast content creation systems; Internet Access Contents; Social labeling systems; Content Reputation Systems; Recommendation Systems.

## OER'S PRODUCTION CYCLE WITH SOCIAL AUDITORY AND SEMANTIC TOOLS

An OER is the result of a whole educational resource product cycle which implies a set of sequential stages; each of them accomplishes a specific purpose; on this production cycle are considered the needs of the educational community: teachers and students.

The construction of the OER involves use, reuse, and digital resource creation such as videos, texts, slides, and metadata development associated to those resources which allow the storage and cataloging in repositories.

Also have to be considered the needs of teachers and students to integrate it in a project with expert and users participation generating a user collaborative and pleasant learning environment; with this purpose it is recommended to use social web 2.0 tools where it is possible to load contents created with social and collaborative goal which generates collective intelligence.

To be able to determine the most suitable instructional design where possible to incorporate social and semantic components; it has been made a study of educational resources available in some institutions and was determined that the most used design was ADDIE (Analysis, Design, Development, Implementation and Evaluation).

The instructional design is a point of view which provides each one of the steps to evaluate each student need, design, open educational material development and evaluation of the OER efficiency in the learning process.

There are different models of Instructional Design Models but most are based on ADDIE Model; each stage has tasks generating results, which feed the next stage; Steven J. McGriff has defined tasks and results to each stage of the model.

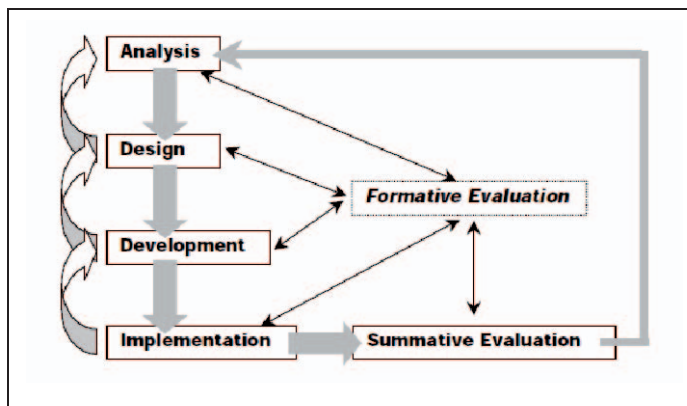


Figure 1. ADDIE Model (Steven J. McGriff, Instructional Systems, College of Education, Penn State University)

For the present social production cycle proposal the five stages of the ADDIE model are complemented and the specific purposes of each one of them are including social and semantic components, application guides and expected results, as shown in figure 2.

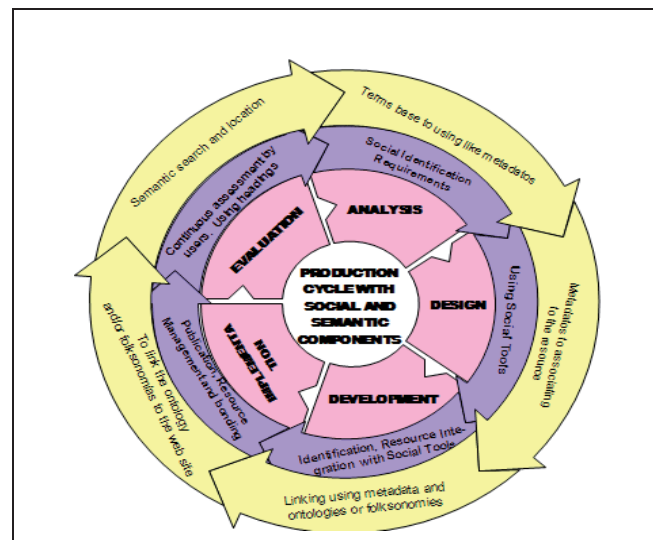


Figure 2. Production Cycle with Social and Semantic Components.

On this proposal of the production cycle the OER's fundamental principles are complemented: reusable, accessible, and interoperating. Reusable, accessible and interoperating. Also, their publication is under Creative Commons License, taking into account that this legal MARCO depends on the inside policies of each institution. [4]

This production cycle is on detail as follows:

### 1. ANALYSIS

At this phase the purpose is to collect student's requirements regarding support of educational resources in the training process, for which they must answer the questions: what do you need to produce? What is the learning problem?

Based on this need, we chose the course of OCW with what is going to work the implementation of the production cycle, it requested the support of teachers of this subject and involving both students and distance modality of this process.

Then with the team of teachers, students and technicians were selected social tools that would serve as a source of requirements gathering, in this case was chosen to Blogs, Social Networking and document analysis through Blogs, Google Docs where tabulated proposals for improving the course.

In the semantic component, identifies the first terms that might be associated with resources such as metadata, which is done in a collaborative way (teachers, students).

### 2. DESIGN:

In this phase has to be defined: What for? For who? How to do it?; where they are involved objectives, contents, structure, categorization, metadata, policies, licenses and user profiles.

In this context the definition of objectives, basic content, structure, classification, metadata, policy was decided to use

blogs, Google Docs thereby promotes the effective participation of designers, experts, teachers, peers, academics, students, staff; also raised areas and periods of social feedback and finally define the metadata of resources.

### 3. DEVELOPMENT:

It consists of starting the design, fundraising for the contents, storage, quality control, production process of resources.

It was agreed to search for and locate resources in social tools (youtube, slidehare) considering the value associated with each resource (using LORI), comments, number of visits, reputation, and to search recovery and development of resources based on the characteristics defined in the design and interoperability, reuse, remix OCW elsewhere, finally makes use of socially defined metadata (folksonomies) to locate available resources and for the editing and packaging content using a software wrapper for the ejemplo The Reload Editor).

On the semantic linking is done using metadata and ontologies Folksonomies.

### 4. IMPLEMENTATION:

It gets online resource, integration and management. They started to use social recommendation to allow linking and integrating the use of other resources and related repositories, the diffusion of new resources is done through microblogging, social networking, RSS, while ensuring quality through the use of control versioning and application of rubrics. On the semantic folksonomy or ontology links to the network.

### 5. EVALUATION:

To monitor, control and improvement of the resource has been considering the evaluation and feedback will be continuous by the users, who are saying if the resource objectives met your expectations or areas for improvement through their comments, as well as the use of Heading to know the level of resource quality on a scale based on the parameters that the user considers relevant for evaluation.

The semantic part is evaluated through effective access to the resource by its meaning and context.

#### IMPLEMENTATION OF THE OER'S PRODUCTION CYCLE

As a OER's production cycle proposal complement with social auditory and semantic tools, it has been applied to one of the courses at the OCW site of the UTPL; next, we describe the application process:

First, it was chosen the course: "Information Fundamentals", due to this is one of the first courses available on the OCW Project at UTPL and because teachers compromised its application to the production cycle.

Information Fundamentals course is where we review and analyze basic knowledge of broad areas of informatics, that constitute a basis for the rest of the subjects they study throughout the race. The course consists of 6 issues that need to be revised over a semester, for which teachers have made a outside class job scheduling and a learning guide and deepen detailing each of the topics.

The test environment of this cycle was conducted with students and distance mode of this course to those who were told that they will participate in an evaluation project of the University's OER for which it takes its impartial criteria regard.

The teachers in this area is in computer engineering, they are constantly updating technology courses which keeps them at the forefront of technology, plus they are reviewing the materials and perform updating of resources.

The following explains how we implement this cycle based application guidelines have been proposed for each phase:

#### ANALYSIS STAGE: The Application guidelines are:

- To implement social tools in the course or subject (blog, wiki, social networking, microblogging).
- To use the social tools available or implemented to raise requirements to the course students.
- To tabulate the proposals to the course improvement; using collaborative tools like google docs, and the subject blog.
- To identify the first metadata.

For which the following activities have been realized:

#### Activities:

- Creation of the subject's blog: <http://blogs.utpl.edu.ec/fundamentosinformaticos>
- Placing a post to the blog users, so, they can help about resource requirements for the subject.



Figure 3. Course's Blog

3. Place an input box on the social network and send it through e-mail to the students who are taking the Information Fundamentals subject, for both: regular and long distance learning system.
4. Tabulation of the figures gotten in point C.
5. To make a requirements report.
6. Metadata identification.

### Results:

You can find the subject blog online at: <http://blogs.utpl.edu.ec/fundamentosinformaticos>. Using virtual learning environment tools (VLE) of UTPL and the blog, it was made a survey [1] to regular (MODALIDAD PRESENCIAL) system students and long distance learning system students who are currently taking the course, to collect resource requirements of the subject.

The results obtained from the survey are:

- 100% of students are sure that the use of social tools will increase their participation in the course.
- 100% of students suggest it should be increased the amount of resources (videos, presentations, additional documents) to illustrate the theory of this subject.
- 75% of students require further depth of the contents.

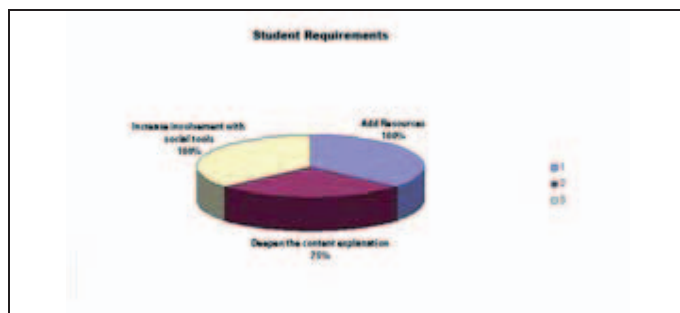


Figure 4. Analysis Stage Requirements

For what has been mentioned, it was suggested to the subject teachers:

- Check the contents.
- To design the didactic material structure of the subject which must include social tools activities (VLE, forums, blogs, social networks).
- As supporting material to please use open educational resources (videos, presentations, etc.) available on the OCW sites to reuse and/or develop new ones adapted to the course contents.

The first metadata were: UTPL, ECC\_UTPL, BASIC COMPUTER, , INTRODUCTION\_TO\_COMPUTER.

**DESIGN STAGE:** Based in he them guides of application of this phase: To re-define aims, contained base, structure, categorization, metadatos and policies considering the aspects identified in the phase of Analysis, as well as the possibilities of the web 2.0 and semantic web to design the new resources; the following activities were realized:

1. Teachers must define objectives for each course unit.
2. The technical team of teachers should specify the course structure.
3. The technical team and the teachers should make the categorization of the resources.
4. The technical team and the teachers should define the metadata.
5. The technical team, the teachers and the intellectual property team of UTPL, must define the licensing and publication policies of the course.
6. To provide feedback on the point a), together with the technical team, teachers, and other teachers/students involved in the subject Information Fundamentals.
7. Define metadata for each resource (videos, presentations, pdf, etc.), the technical team and the teachers together.

### Results:

Contents and objectives on each chapter of the course were redefined by the teachers considering requirements gotten from the analysis stage and suggestions made by the team responsible of the OER's social production cycle. The result is structured in figure 5.

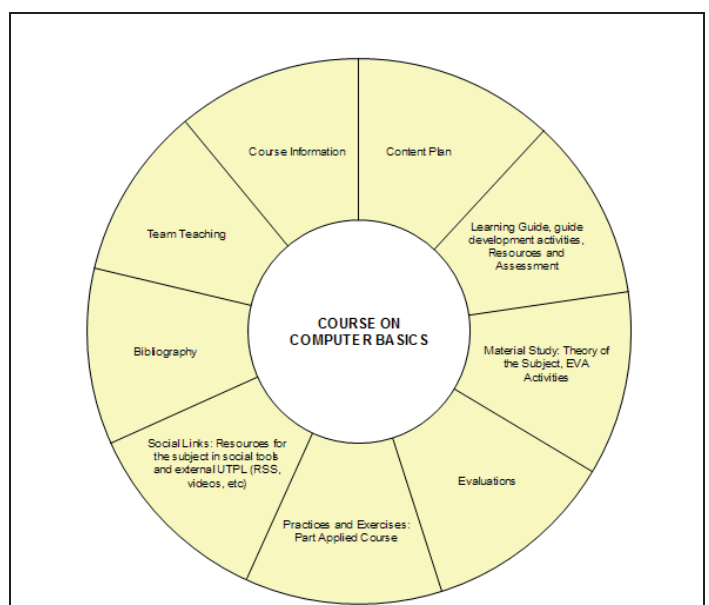


Figure 5. Course Structure



About categorization of resources ready to use or develop, has to be accessible and usable by teachers and students of the course; based on used resources observation it was possible to identify the following: links, videos, presentations, podcast, documents, other. Each course should be identified by: type, topic, description. For example:

Link\_PartsofComputer\_Description;  
Video\_Hardware\_Definitions;  
Document\_Internet\_Evolution

Metadata are an important part of an Open Educational Resource and even more into social cycles, because they allow identifying, retrieving, using and reusing resources socially generated, that is why it becomes important their definition and management, this was the reason it was defined three metadata types:

- **General:** its main purpose is positioning and filtering where it must be obligatory included in all OCW resources which should have the institution name, school, subject: for example: UTPL, ECC\_UTPL, fundamentos\_informaticos\_utpl
- **Specific:** with the content search and retrieving object of the resource, it is included by teacher's criteria, technical and support staff, for example: Computing Introduction, Computing fundamental concepts, Information Fundamentals, Basic IT, Computing general concepts: computer, hardware, peripherals, software, Propositional Logic, propositions, logic tables, computer language, data bases, software quality, numbering systems, computer networks, Internet, social networks, Web 2.0, network security, virus, antivirus, information systems, artificial intelligence, natural language, neuronal networks, expert systems.
- **Social:** these are added by suggestion of who observe and use the resource.

With these data is generated the basic general and specific metadata taxonomy for the subject; on the management section, metadata should be put in all social tools implemented to support the OCW blog, wiki, etc. Same should be associated to the resources according to the former mentioned classification.

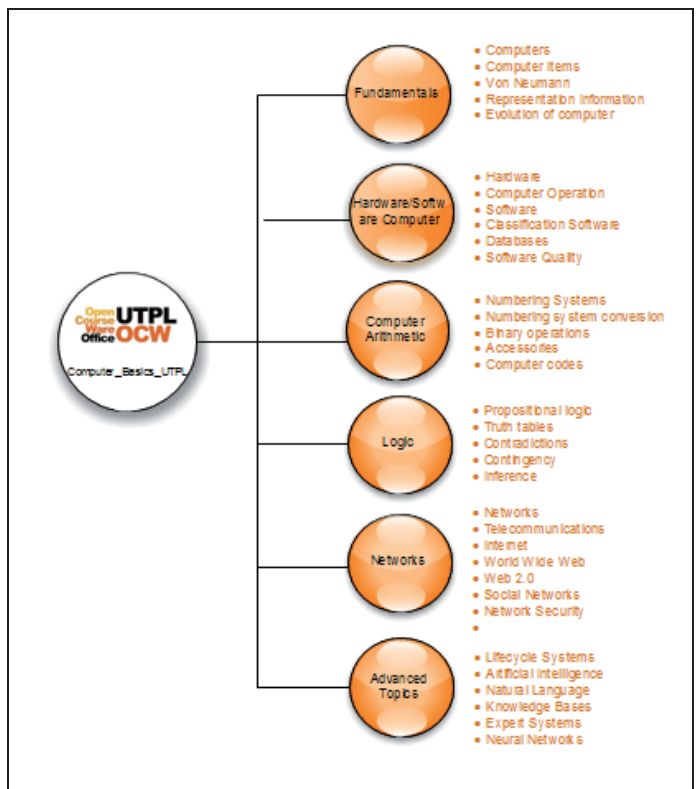


Figure 6. Course Taxonomy

Resources used in the current subject should be in the context of UTPL resource production policies; which considers that an Educational Resource is made from those academic contents used in the teaching-learning process that should be licensed under Creative Commons Ecuador 3.0: with recognition, not commercial and without derivative works.



**DEVELOPMENT STAGE:** In this phase there must be resources in social tools in universities or in other sites Open Course Ware; to select pertinent resources of agreement to the relation with the subject matter, visual quality and To adapt or to create the resources for the course; for which one Proceeded to look and locate Resources from Social Tools as youtube, slideshare and of sites OCW; in addition resources were selected on the basis of the taxonomía defined in the fase of Design; to be able to re-use these resources and create new that adjust to the needs identified in the phase of Analysis.

#### Activities:

- Search and location of resources from social tools like youtube, slideshare and OCW sites.
- Resource selection based on the defined taxonomy at

the design stage, so it makes possible to reuse these resources and create new ones adjusted to identified needs on the Analysis Stage.

## Results:

The development stage started on OCWC site using course searching engines, and using as searching terms the taxonomy define don the Design Stage. Downloading only individual resources not full courses.

Also, it was filtered the Youtube cannel to UTPL2, the videos related to the course using determined taxonomy where were found the following resources:

IT FUNDAMENTALS RESOURCES ON UTPL YOUTUBE CHANNEL

File Type	Found resources
Documents	12
Presentations	4
Videos	13

To choose resources and measure their quality, it was used signatures as resource evaluation element, which considered the following criteria:

- **Validity:** specifies applicability of the resource according to the creation date.
- **Content:** considers content relevance according to the topic.
- **Language:** evaluates the right use of language (composition, spelling, grammar).
- **Didactic:** considers correct organization to keep student's attention, understanding and learning.
- **Applicability:** evaluates the relationship between theory and practice.
- **Video Quality:** analyzes quality criteria of digital material (applies to video resources).
- **File format:** evaluates interoperability between the formats used in the resources.
- **License:** specifies the kind of use the resource can be provided with.

To evaluate these criteria, it was used three validation levels: very good, acceptable and regular.

- **Very good:** states that the evaluated criterion is the best for the resource use.
- **Good:** shows that the reviewed criterion is acceptable for the use of the resource.
- **Regular:** Señala que el criterio evaluado tiene ciertas limitaciones para su utilización.

It is suggested to use only those resources validated as Good or Very good and to drop the Regular ones.

Finally, it was made the resource adaptation and/or creation:

- **Resource adaptation:** it was used two documents about computer operation and architecture, it was taken important sections and was generated a new document Documento-Estructura-Funcional-Computador-Descripcion. Also, from many videos it was extracted some exercise sections and was generated the file Video-Operaciones-Binarias-Ejercicios.mov
- **New resource Creation:** it was considered: a) Use of social tools such as google/docs for document creation. b) Use of Camtasia Studio as capture, edition and format definition software, or the recording infrastructure of the UTPL Videoconference Department.

**4) IMPLEMENTATION STAGE:** In this phase the recurso must join modified or created from the needs found in the phase 1 for which the following activities were realized:

- Load on the OCW platform of the course, the resources created on the development stage.
- To provide RSS tools to link open educational resources with other OCW sites with the UTPL OCW repository.
- To spread the course updating through twitter, social network of the EVA, the subject blog.
- To implement visits report tools.

## Results:

After adding the resources produced on the development stage inside the course structured; it was added RSS resources to the IT Fundamentals courses of external OCW sites through the RSS Feed portlet.



Figure 7. OCW initial site



Figure 8. OCW current site

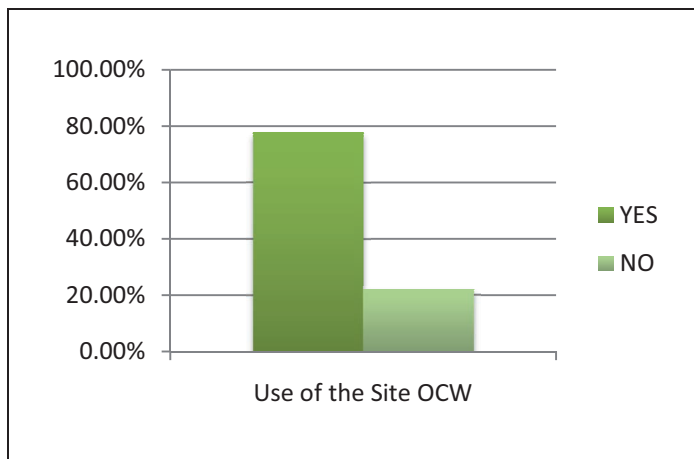


Figure 9. OCW\_UTPL site use

Also, the new resources were spread in the social network of the Virtual Learning Environment and inside the subject blog.

**EVALUATION STAGE:** It is necessary to value the quality of each one of the resources of this course; for which it is necessary to use the blog of the matter to request the feedback the students of the matter on the new resources placed in the site OCW of the institution; to realize the application of paragraphs to the resources of the matter of IT foundations; to realize control of versions across a shared document of Google docs between teachers and equipment responsible for the offer of the cycle and finally to use tools of reports to give follow-up to the visits registered to the resources of the course; for which the following activities were realized:

1. To use the EVA blog and the social network of the subject to ask the subject students for feedback about the new resources loaded on the owc.utpl.edu.ec site.
2. Applying signatures to the IT Fundamentals resources.
3. Version control through a shared document of Google docs among teachers and the responsible team of the cycle proposal.
4. Use of report tools for monitoring the visits to the course resources and to store records of the course resource use.

### Results:

After spreading the new resource implementation, the OCW course was evaluated through surveys applied to students, where we could find the following results.

After OCW site use; 77% of students who answered the survey use OCW as support tool in the learning process.

About the resource contribution on the subject understanding; 94.40% of the respondents said that indeed it contributed to the subject understanding; while a 5.60% said it was not use for this purpose.

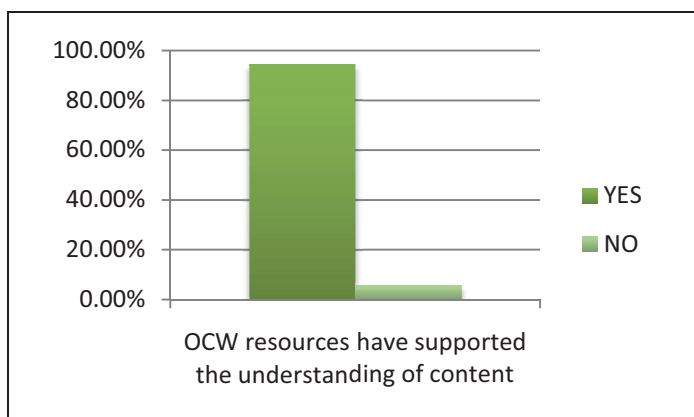


Figure 10. OCW course contribution

About the number of mistakes on OCW; 2.22% said that there are enough, while 97.78% said that there are not enough; they suggest that more resources should be incorporated, especially videos, exercises, auto tests. As indicated in figure 11.

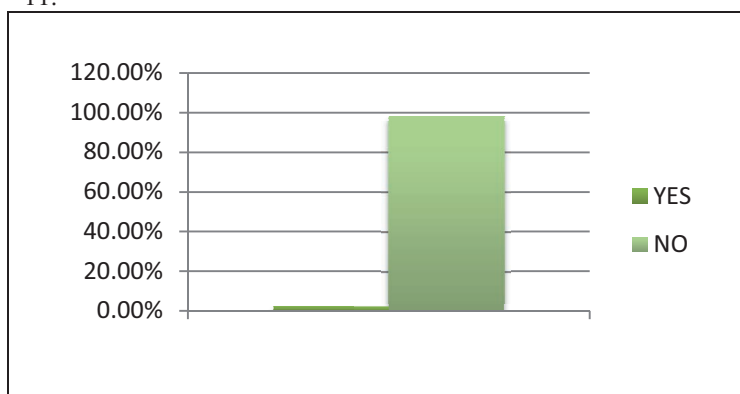


Figure 11. Qualification of the OCW\_UTPL number of resource available.

It was also asked to rate the quality of the resources; 27.78% said they were very good and 72.22% said they were good. It is important to mention that the rating scales used on the resources were Very good, good and regular.

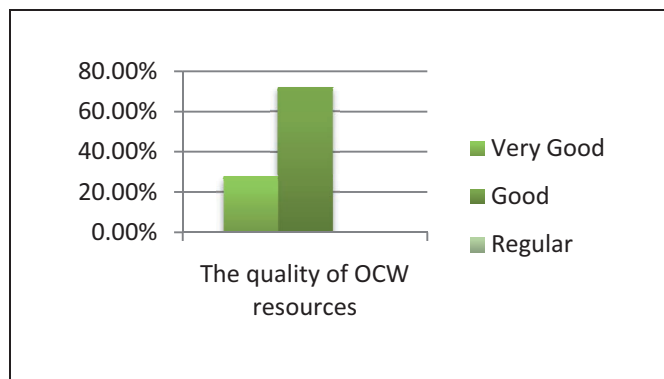


Figure 12. OCW\_UTPL Quality Resources

From this evaluation it can be concluded that the resource quality available at OCW\_UTPL are good, however the following aspects must be improved:

- Increase the amount of resources, especially videos, exercises and auto tests.
- It must be increased the spreading of OCW resources inside and out of the institution.
- It must be increased the number of social tools for a better teacher-students interaction in contribution of higher collective intelligence.

Finally there has been implemented a tool of statistics of visits in the site OCW-UTPL; which has allowed to observe the increase of visits that this site has had in the last semester; since it 13 are demonstrated in the figure; which also has allowed to verify the qualit level of the course across the survey realized to the students wherefrom 72.22 % has considered it to be a course with good quality of contents and resources.

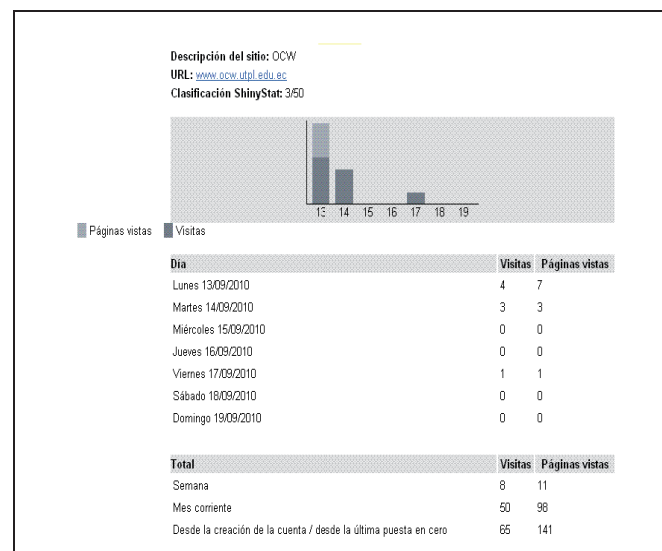


Figure 13. OCW\_UTPL Statistics visits

## CONCLUSIONS

To achieve that the OER have typical of social authorship, it is necessary to to possess the collaboration of an interdisciplinary equipment characterized by the interaction and contribution of each one of his members. To this it is necessary to to add the use of collaborative tools (Web 2.0) as: systems of authorship and use, rapid creation of contents, social labelling, reputation of contended and recommendation. On the other hand to provide with semantic meaning the OER, it is necessary to incorporate tools of the Semantic Web like the metadatos and the educational ontologies which will improve the characteristics of usabilidad, accessibility and visibility.

There are some instructional design model alternatives, however, most institutions have trust ADDIE in OER production, because of its flexibility in adapting new requirements to the quality evaluation they need.

To include social components in the OER's production cycle making it easier the collaborative teachers-students learning.

The OER's production cycle with social and semantic components decreasing the total time of construction due to reuse of resources available in social tools; In addition it constitutes an opportunity, to take advantage of the kindness of these web trends that contribute relevancy, relevancy and meaning to the resources.

The success of the model application depends on the institutional context where it is implemented and the policies about content generation, author recognition and resource broadcasting.



To develop OCW courses it is possible to use other OER, because there are social repositories, a wide number of quality educational resources available to be reused in other contexts; nevertheless it is necessary to realize necessarily a quality evaluation of the existent resources are an important filter towards optimum resource production.

#### ACKNOWLEDGMENT

The present work has been partially sponsored by the Ecuadorian Government through the Science and Technology Secretary (Ministry).

It is also important to mention that this project has been developed with support of the project AL11-P(I+D)-17 (UPM) the Politechnical University of Madrid.

#### REFERENCES

- D'Antoni S., "Open Educational Resources The Way Forward", February 2008, [Online], Available on: [http://oerwiki.iiep-unesco.org/images/4/46/OER\\_Way\\_Forward.pdf](http://oerwiki.iiep-unesco.org/images/4/46/OER_Way_Forward.pdf).
- Santacruz-Valencia, Delgado Carlos (2004), Objetos de Aprendizaje: Tendencias dentro de la Web Semántica, España, [Online], Disponible en: <http://en.scientificcommons.org/1734567>
- Monge S., Ovelar R.; "Repositorio 2.0: Dinámicas Sociales para favorecer el desarrollo de comunidad en torno a un repositorio de contenidos educativos digitales". Disponible en <http://spdece07.ehu.es/actas/Monge.pdf>
- Cueva S., Rodríguez G., Romero A.; "OER'S PRODUCTION CYCLE WITH SOCIAL AUTHORSHIP AND SEMANTIC TOOLS"; EDUCON 2010, Available on: [http://ieeexplore.ieee.org/xpl/freeabs\\_all.jsp?reload=true&arnumber=5492588](http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?reload=true&arnumber=5492588))