



## El observatorio de investigación sobre los *massive online open courses*: MOOCservatorio®

### The research observatory on the massive online open courses: MOOCservatorio®

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#### RESUMEN.

La nueva modalidad de expansión del conocimiento los MOOC, los cursos en abierto, masivo y en línea, que forman parte de los nuevos tejidos educativos de la mayoría de universidades de prestigio internacionales, pueden erigirse como elemento dinamizador curricular en los ecosistemas bióticos de las instituciones educativas, limitadas en el tiempo, acotadas espacialmente y reservadas con frecuencia a élites sociales. De esta manera se podrá trascender a nuevos escenarios de aprendizaje ubicuos, conectivos, informales, y horizontales que faciliten la inclusión digital de las personas más desfavorecidas. Actualmente, con el extraordinario aumento de la oferta educativa de cursos MOOC conduce, en la mayoría de casos, a una desorientación por parte del estudiantado. En este sentido, objeto de estudio del presente artículo científico, se hace necesario el diseño y elaboración de un observatorio de investigación sobre MOOC: MOOCservatorio®, en aras de la expansión del conocimiento científico y el empoderamiento social.

#### PALABRAS CLAVE.

Educación superior, Innovación educativa, COMA, Observatorio Digital.

#### ABSTRACT.

The new modality of expansion of knowledge (MOOCs), the Massive, Open and Online Courses, which are part of the new educational contexts of most international prestigious universities, can be considered as a dynamic curricular element in the biotic ecosystems of educational institutions, limited in time and space and frequently reserved for social elites. In this way, it will be possible to transcend to new ubiquitous, connective, informal, and horizontal learning scenarios that facilitate the digital inclusion of the most disadvantaged people. Currently, the extraordinary increase in the educational offer of MOOC courses



could lead, in most cases, to students' disorientation. In this sense, the object of this article is to justify the need to design and elaborate a research observatory on MOOCs: MOOCservatorio®, in order to expand scientific knowledge and social empowerment.

## KEY WORDS.

Higher education, Educational innovation, MOOC, Digital Observatory.

### 1. The digital research observatories.

Traditionally, university education has been based on a methodological model centered on the teacher, with emphasis on the transmission of content and its reproduction by the students, the master's lesson and individual work (López-Meneses, Vázquez-Cano and Jaén, 2017).

Today, all of this is changing in the world of education, and both society and technological advances are introducing new methods in this field (Sosa Lopez and Diaz, 2014, Vazquez-Cano, López-Meneses and Barroso, 2015; Zamora, 2015; Taylor and Ruiz, 2016, Hood Cattaneo, 2017). In this sense, one of the most interesting changes in the educational world has been the introduction of mass courses online and in open courses (known by the acronym "MOOC"), which one can take into consideration according to informative literature and scientific revolution with great potential in the world of education and training (Bouchard, 2011; Aguaded, Vázquez-Cano, and Sevillano, 2013). The MOOCs have monopolized this worldwide interest due to its great potential to offer a free and accessible training to anyone regardless of their country of origin, their previous training, and without the need to pay for their registration (Daniel, 2012; Christensen et al., 2013; Radford et al., 2014.). There is also a consensus in the scientific community about the importance and popularity of this movement, mainly due to its international reach and the opportunity to offer a highly diversified superior education (López-Meneses, Vázquez-Cano and Román, 2015; León-Urritia, Cobos and Dickens, 2018; Vázquez-Cano, López-Meneses and Martín Padilla, 2018).

Also, according to Pérez-Parra and Gómez-Galán (2015) the MOOC offer an innovative model of mass education, which exploits paradigmatically the potential and relevance that technologies in Information and Communication currently have in modern society and in the scientific literature available describes the MOOC as virtual environments offering social connectivity over an area of study with an open educational approach (McAuley et al., 2010; Vázquez-Cano, López-Meneses and Barroso, 2015; Ramírez-Fernández, 2015; Aguaded, Vázquez-Cano and López-Meneses, 2016; Gómez Galán and Pérez-Parras, 2017; Gómez-Galán, 2017; Mengual-Andrés, Vázquez-Cano and López-Meneses, 2017). In turn, they are offered by many of the best institutions in the world and can be a turning point in Higher Education (López-Meneses, 2017). In this regard, it may be relevant to scientific and social progress of modern society, design, development and evaluation of a Digital Observatory on MOOC, for observation, analysis and specialized information on open massive courses, and in the network.

Moreover, references to the term "observatory" is more and more frequent as noted by Albornoz and Herschman (2007) in the language of scientists, journalists and politicians in Europe and Latin America; academic institutions and foundations have designed



observatories of different types to systematically monitor the progress of a sector or a specific problem. There are observatories related to different topics: racism and xenophobia, immigration, industrial relations, technology, environment or gender violence... till the authorities of the Louvre Museum have launched their own observatory in order to know in detail who visits the famous art gallery.

Maiorano (2003) states that the observatories are subsidiary bodies, collegiate and plural integration should provide better information to the public and facilitate decision-making by the responsible authorities. For their part, Correa and Castellanos (2014) state that the observatories are spaces for reflection based on reality; they allow one to align the information and its conservations in specific fields; its indicators and results address situations in context to better understand them and even foresee future effects for the good of the people interested in their object of study or for society. In turn, it generates a knowledge with a high level of importance to the current and novel, which can be used by recipients who have an interest in that information (De la Vega, 2007).

According to the United Nations Development Program (UNDP, 2004), the work of an Observatory, in general terms, is related to the following areas of work:

- Data collection and database development.
- Methodologies to encode classify and categorize data.
- Connection of people / organizations working in similar areas.
- Specific applications of the new technical tools.
- Analysis of trends / publications.

Ultimately, one can say that a digital Observatory is a space in which projects are related to the use, implementation and appropriation of technologies of information and communication, in order to promote technological development work in entities from different areas generating economic and social impacts (Torres and Martinez, 2014). This study is aimed at the development and implementation of a research observatory on MOOC: MOOCservatorio®.

## 2. Methodological scenario.

The methodological research scenario highlights its mixed, systemic and integrative nature. In turn, it overcomes the methodological monism and quantitative / qualitative polarity, all in order to compete in the dialectic symbiosis of both perspectives and a strategy of a complementary approach, and the convergence of knowledge and comprehensive analysis of the phenomenon under study, to design and develop a MOOC Research Observatory: MOOCservatorio®. Then, the aims and four general phases of the study are described.

### 2.1. Objectives of the study.

This research study pursues the following objectives:

- Design an assessment tool called Digital Observatories MOOC: CUVOMOOC®.
- Planning and implementing a research observatory MOOC: MOOCservatorio®.
- Offer and disseminate relevant and qualitative scientific and academic information on the MOOC field to the scientific community.



Visually it is depicted in Figure 1 the various objectives which constitute global research.

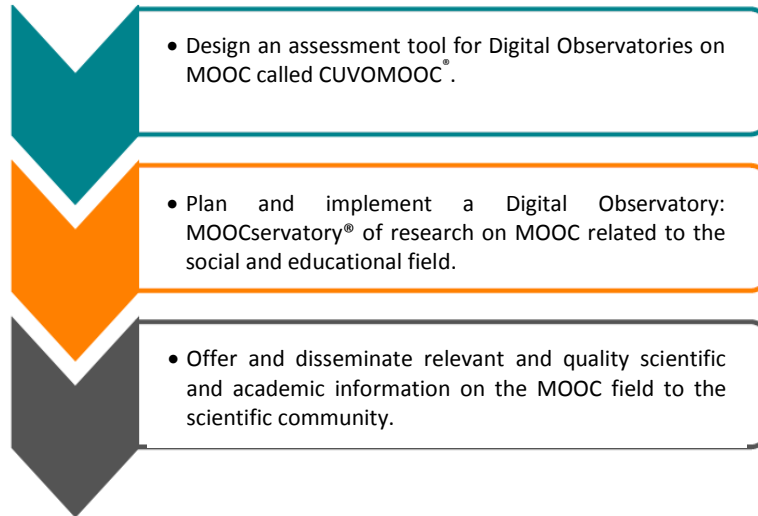


Figure 1. General objectives of global research.

MOOCservatorio®: MOOC research linked to the social and educational field. In this research the planning and development of a Digital Observatory focuses especially on the second goal in particular.

### 2.2. Stages of research for the development of MOOCservatorio®.

The design and development of research observatory MOOC: MOOC Observatory was conducted in four stages of research (Figure 2).

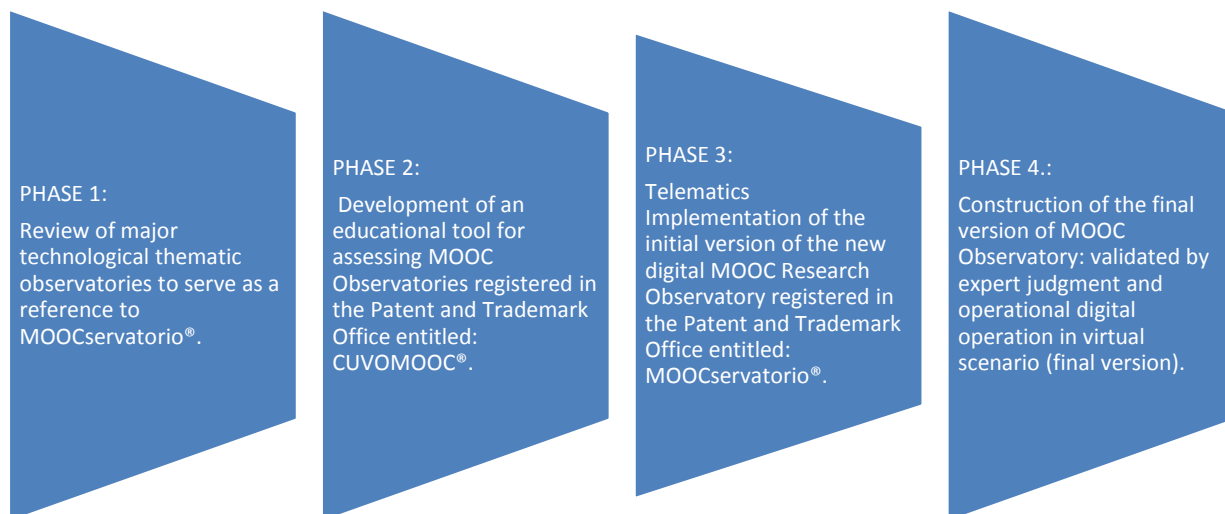


Figure 2. Phases of research for the development of MOOCservatorio®.



Then one described the different stages that constitute the research study for the development of MOOCservatorio®.

*PHASE 1: Review of major technological thematic observatories to serve as a reference to MOOCservatorio®.*

The first phase begins with the descriptive overview of the major technological observatories and those related to information technologies and national and international communication, under the terms of ten experts in information and communications technology (ICT hereinafter) belonging to the Group research Eduinnovagoría® (HUM-971) considered significant and relevant for the development of open research observatories called: MOOCservatorio®. The following were also studied:

- INTEF Observatory. URL: <http://recursostic.educacion.es/observatorio/web/>
- ONTSI Observatory. URL: <http://www.ontsi.red.es/ontsi/>
- CENATIC Observatory. URL: <http://observatorio.cenatic.es/>
- ONTSI Observatory. URL: <http://www.ontsi.red.es/ontsi/>
- CENATIC Observatory. URL: <http://observatorio.cenatic.es/>
- SCOPEO Observatory. URL: <http://scopeo.usal.es/>
- OSIMGA Observatory. <http://www.osimga.gal/es/index.html>
- Observatory ODITE. URL: <http://odite.ciberespinal.org>
- AOSTI Observatory. URL: <http://aosti.org/>
- International Telecommunications Union. URL: <http://www.itu.int>
- Ibero-American Observatory of Science, Technology and Society. URL: <http://observatorioocts.org/>
- Information System of Educational Trends in Latin America. URL: <http://www.tic.siteal.org/>
- PortalProgramas Technology Observatory. URL: <http://www.portalprogramas.com/observatorio/>
- Digital Observatory of the General Secretariat of the Presidency of the Government of Chile. URL: <http://www.observatoriodigital.gob.cl/>
- ICT Observatory Ministry of Telecommunications and Information Society of the Republic of Ecuador. URL: <https://www.telecomunicaciones.gob.ec/observatorio-tic/>
- Colombian Observatory of Science and Technology (OST). URL: <http://ocyt.org.co/es-es/>
- Observatory of Information and Communication Technologies. URL: <http://observatic.edu.uy/>
- Open Education Europe. URL: <http://www.openeducationeuropa.eu/>
- Open Education web portal Europe. URL: <https://www.openeducationeuropa.eu/>
- MOOC Observatory. URL: <http://blog.soton.ac.uk/mobs/about/>
- Information Society Observatory. URL: <http://ifap-is-observatory.ittk.hu/>

Finally, we should mention the European IT Observatory. URL: <http://www.eito.com> (European Monitoring Center for Information Technology), as stated on its website, provides updates on European and global markets for information technology IT, telecommunications and consumer electronics. The EITO is managed by Bitkom Research GmbH, a wholly owned subsidiary of BITKOM, the Federal Association for Information Technology, Telecommunications and New Media in Germany. The research activities of the EITO Working Group are supported by the European Commission and the OECD (Figure 3).



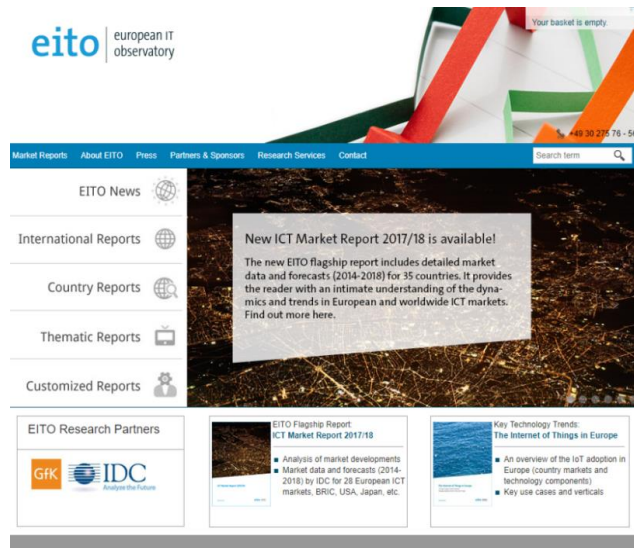


Figure 3. Web the European IT Observatory. Source: <http://www.eito.com>

**PHASE 2: Development of an educational tool for assessing MOOC Observatories registered in the Patent and Trademark Office entitled: CUVOMOOC®.**

The validation process was handled by the Assessment Questionnaire Observatories MOOC Digital: CUVOMOOC®, registered in the Patent and Trademark Office, effective file number: 3554725, the modified two rounds consisting of twenty teachers and ICT experts; for the preparation and perfection of said teaching tool (Table 1) Delphi technique was used.

Experts (20)	Universities
Dr. D. Julio Cabero Almenara.	Universidad de Sevilla.
Dr. D. José Ignacio Aguaded Gómez.	Universidad de Huelva.
Dr. D. José Luis Salmerón Silvera.	Universidad Pablo de Olavide.
Dra. Dña. Verónica Marín Díaz	Universidad de Córdoba.
Dr. D. Manuel Cebrián de la Serna.	Universidad de Málaga.
Dr. D. Esteban Vázquez Cano.	Universidad Nacional de Educación a Distancia.
Dra. Dña. María Esther del Moral Pérez.	Universidad de Oviedo.
Dr. D. Jesús Valverde Berrocoso.	Universidad de Extremadura.
Dr. D. Carlos Castaño Garrido.	Universidad del País Vasco.
Dr. D. Manuel Área Ramón.	Universidad de La Laguna. Islas Canarias.
Dr. D. Juan Antonio Morales.	Universidad de Sevilla.
Dra. Dña. Adolfinia Pérez i Garcias.	Universitat de les Illes Balears.
Pere Marquès Graells.	Universidad Autónoma de Barcelona.



Francisco Revuelta Domínguez.	Universidad de Extremadura
María Rosa Fernández Sánchez.	Universidad de Extremadura.
Dra. Dña. Noelia Margarita Moreno Martínez.	Universidad de Málaga.
María José Sosa Díaz.	Universidad de Extremadura.
Jordi Adell Segura.	Universitat Jaume I. Castellón.
Santiago Mengual Andrés.	Universidad de Alicante.
Cristóbal Suárez Guerrero.	Universidad de Valencia.

Table 1. List of experts for the Delphi studies.

The first Delphi study was conducted in March of the academic year 2015-16 and was constituted by ten open questions (Table 2) Prepared aimed at 20 ICT experts and professors.

1.	Have you developed your university teaching work in subjects related to Information and Communication Technologies?
2.	How many years of teaching have you taught in subjects related to ICT?
3.	Have you participated in any research project and / or teaching innovation related to virtual training or ICT in the last 5 years?
4.	What data related to the identification of an observatory on MOOC should appear?
5.	What dimensions do you think would be appropriate for the development of an observatory on MOOC?
6.	What elements would you consider relevant in each of the dimensions you have described?
7.	What aspects related to the content do you think should be considered in an observatory on MOOC?
8.	What technical aspects do you think should be considered in an observatory on MOOCs?
9.	What aspects related to management do you think should be considered in an observatory on MOOCs?
10.	Indicate, please, other aspects that you consider should be contemplated in an observatory on MOOCs.

Table 2. Initial questionnaire to collect information on the construction of CUVOMOOC®.

Concerning the second Delphi study, once collected and analyzed data from the first Delphi study, the research team sent by the end of November of the same year, the new electronic questionnaire results of the contributions and reflections of the 20 ICT experts. There was created an "ad hoc" service, using Google Forms:

[https://docs.google.com/forms/d/e/1FAIpQLSfVnW2HDYvWv8yAyem6R\\_EUMI62JF-IVM8-n5KFss7WiMSc3Q/viewform](https://docs.google.com/forms/d/e/1FAIpQLSfVnW2HDYvWv8yAyem6R_EUMI62JF-IVM8-n5KFss7WiMSc3Q/viewform).





which serve as a frame of reference for observatory work in the construction of the initial version of the Research: MOOCservatorio® corresponding to the next stage of research.

*PHASE 3: Telematics Implementation of the initial version of the new digital MOOC Research Observatory registered in the Patent and Trademark Office entitled: MOOCservatorio®.*

After reviewing the relative literature the most relevant technological observatories worldwide, corresponding to the first phase of the investigation, in symbiosis with the analysis of the scientific contributions and teaching suggestions obtained in the various Delphi studies in which is crystallized the CUVOMOOC® teaching tool, in the third phase telematics implementation of the initial version of the new digital MOOC research Observatory registered in the Patent and Trademark Office is called : MOOCservatorio®. It pretends to be a vehicle for dissemination and communication of traditional sources of information, such as scientific articles, e - book, scientific sites about MOOC in line with other virtual communication channels and forums related to this issue.

*PHASE 4. Construction of the final version of MOOC Observatory: validated by expert judgment and operational digital operation in virtual scenario (final version).*

The last phase involves going forward in data analysis through expert judgment of the final version of the digital MOOC Observatory research resulting in the Observatory: MOOCservatorio® with URL: <http://www.moocservatorio.com/>

### 3. Results of the investigation.

This caption shows summarized the analysis and discussion of the results carried out around the data collected by instruments of quantitative and qualitative methodology described in the scenario to meet the goals outlined in the baseline character. Specifically, it starts with the results of the review of the scientific literature related to the main technological observatories and those related to ICT. Subsequently, the interpretation of the two studies is set by Delphi summarized teaching tool for making the assessment observation on MOOC (CUVOMOOC®). MOOCservatorio®: Subsequently, once the instrument obtained through telematics, it then described the initial version of Observatory MOOC research. Finally, one recognizes the results of the interviews with six experts in ICT for validation of the final version of MOOCservatorio®.

En este epígrafe se muestra de forma resumida el análisis y discusión de los resultados llevado a cabo en torno a los datos recopilados por instrumentos de carácter cuantitativo y cualitativo descritos en el escenario metodológico para responder a los objetivos planteados en el inicio del estudio. En concreto, se inicia con los resultados de la revisión de la literatura científica relacionada con los principales observatorios tecnológicos y aquellos vinculados con las TIC. Seguidamente, se exponen de forma resumida la interpretación de los dos estudios Delphi para elaborar el instrumento didáctico de valoración de Observatorios sobre MOOC (CUVOMOOC®). Posteriormente, una vez, obtenido dicho instrumento se describe la versión inicial telemática del Observatorio de investigación sobre MOOC: MOOCservatorio®. Por último, se muestran los resultados de las entrevistas





realizadas a seis personas expertas en TIC para la validación de la versión final del MOOCservatorio®.

*RESULTS OF THE PHASE 1: Review of major technological thematic observatories to serve as a reference to MOOCservatorio®.*

The first phase begins with the descriptive review of the main technological observatories and those related to information technologies and national and international media, in this regard, once analyzed exhaustively these national and international technological observatories note the following characteristics:

- Offer an informative presentation of the Observatory of research on MOOC.
- Regarding the distribution of scientific content it should be guided by nested tabs.
- It must be organized through "tags" or labels of the conceptual framework of scientific content of MOOCservatorio®.
- Have a newsletter.
- Structure the information from the simplest to the most complex, to improve meaningful learning.
- It would be very interesting to implement RSS syndication that allows subscription to news, events, etc.
- The creation of a content search engine of the Observatory and located in the upper right.
- The use of different social bookmarks such as Facebook, Google +, Twitter.
- A virtual space for the presentation of the institution or organization that supports the Observatory on MOOC.
- One books a virtual space for the presentation of visual cues to guide the wearer to navigate and determine which section is it exactly (breadcrumb or breadcrumb)
- The scenario textual research Observatory MOOC must be legible, static, avoiding excessive capitalization, with text alignment left and a balanced contrast with the background. In this regard, background digital environment should preferably be white.
- Offer an email to contact the Digital Observatory.
- The contrast in color should be used to highlight concepts and keywords as it helps to read content.
- Reserve a space for housing the Frequently Asked Questions (FAQs).

In conclusion, it can be inferred that most of them follow a friendly environment, with the possibility of moving between the contents of the Digital Observatory and an upper bar contacts "scrolling", log in, etc. In the middle of the workspace appears the most important and relevant information. In addition, most of them inserted classic sources of scientific-technological (databases of scientific information, websites, standards, etc.) sources derived from the process of creating new technologies by the academic sector (scientific information events, experts bases, virtual forums, reports and research studies, etc.) to be taken into account in the preparation of MOOCservatorio®.





**PHASE 2 RESULTS: Development of an educational tool for assessing MOOC Observatories: CUVOMOOC®.**

In this phase one analyzes valuations issued by ICT experts for the teaching tool for assessing Observation on MOOC (CUVOMOOC®) derivatives of Delphi studies. For lack of space this phase is exposed only in a summarized presentation

Regarding the analysis of information derived from the first Delphi study it is worth noting the first three bio-gram issues of respondents, which corresponds to some indicators expressed by the considerations of experts for investigation (Abdolhamadi Y Shanteau, 1992), it then follows that the experts selected are relevant, competent and suitable for the preparation of a questionnaire for assessing Digital Observatories MOOC (CUVOMOOC®) for their extensive teaching related to ICT, for their long experiential baggage and their knowledge, studies and research carried out on the subject. Ultimately, the experts selected are individuals whose situation and personal resources enable a positive contribution to the granting of the order that has led to the Delphi (Landeta, 2002) work and also are individuals capable of providing reliable assessments of the issues in question (Mengual, 2011).

Referring to a coding and categorization of items (4-10) led experts to construct the final version of CUVOMOOC®. The following results should be highlighted in a summarized way:

As to item 4: What data relating to the identification of a research observatory should MOOC appear? In this regard, it is observed that more than 20% of the experts' opinion is that the name of the institution or organization (20.51%) and its contents (21.79%) should appear. Followed by a (17.95%) by sponsors, contact information (16.67%), Digital Observatory objectives (10.26%). And three of the experts noted that recipients should be displayed in the Observatory, two of them stated that the Curriculum Vitae of coordinators and / or directors thereof are displayed. And only one expert indicated as data relating to the identification of a research observatory MOOC license, publications, data collection procedure, how to collaborate or transfer the Observatory to the educational community (Table 3).

Data related to the identification of a MOOC research observatory	Frequency	Percentage
Institution or organism.	16	20,51
Contents.	17	21,79
Sponsors	14	17,95
Contact information.	13	16,67
Objectives-mission-purpose.	8	10,26
Recipients.	3	3,85
Director / coordinators.	2	2,56
Publications.	1	1,28
License.	1	1,28
What does it contribute to the educational community?	1	1,28
How to collaborate.	1	1,28
Data collection procedure.	1	1,28
<b>Totals</b>	<b>78</b>	<b>100</b>

Table 3. Frequencies and percentages corresponding to the fourth question of the first Delphi study.



Referring to the next item 5: What dimensions considered are suitable for the development of a research observatory MOOC? It is stated that 18 subjects respondents stated that the Didactic dimension (40.90%) together with the organizational and technical (29.55%) dimensions, respectively, should be considered for the construction of an assessment questionnaire Observation MOOC.

In item 6: What elements would you consider relevant in each of the dimensions you have described? In the first place, it is considered relevant for a better understanding of it, to make a description broken down into the three dimensions described in the previous item. In this sense, in relation to the Didactic dimension, the significant elements that must be considered are: content (21.82%), followed by objectives, activities and evaluation (12.73%) respectively, methodology (10.91%), competences (7.27%), timing and previous training requirements (5.45%) and training, educational models and communication resources (3.64%).

Regarding the Technical dimension, the relevant elements that must be taken into account are: the platform / technology used (25.93%), followed by Design / Navigation (18.52%), the necessary technical requirements, the social media used and the technical guide (14.81%), respectively. Ultimately, three experts consider usability as an important element that should be considered in the Technical Dimension

Lastly, regarding the Organizational / Communicative / Social dimension, more than 33% of the respondents stated that social networks and collaboration would be relevant to take them into account in this dimension. Likewise, it is inferred that more than a quarter of the experts (27.78%) indicated that the certification criteria and the duration of the course are relevant in this dimension. Finally, two experts pointed to the follow-up and help as an important element in the Organizational dimension.

In item 7: What aspects related to the content do you think should be considered in a MOOC Research Observatory? The data analyzed corresponding to item 7, reflect that the resource directory (20, 73%); the schedule of events and news about MOOC (19.51%), the current questions (FAQ) (17.07%); the organization in sections (14.83%), the objectives (12.20%); the types and language style (8.54%) and, to a lesser extent, the guidelines for the creation of quality MOOCs, pedagogical evaluation and MOOC technique, a network of teachers, prerequisites and how to collaborate are the most important aspects related to the content that should appear in a digital Observatory research MOOC (Table 4).





Aspects related to the content that must appear in a MOOC observatory	Frequency	Percentage
Objective / Mission of the observatory.	10	12,20
Organization in sections.	12	14,63
Type and style of language.	7	8,54
Events and news schedule.	16	19,51
Directory resources.	17	20,73
FAQ	14	17,07
Guidelines creation mooc quality.	1	1,22
Pedagogical evaluation and mooc technique.	1	1,22
Mooc faculty network.	1	1,22
Previous requirements.	2	2,44
How to collaborate?	1	1,22
<b>Totals</b>	<b>82</b>	<b>100</b>

Table 4. Frequencies and percentages corresponding to question 7 of the first Delphi study.

Regarding item 8: What technical aspects do you think should be considered in a MOOC research observatory? The expert opinion that the technical aspects to be displayed on a research observatory MOOC are: search engine (21.33%), multiplatform and / or multi - device (20%); the accessibility of the Research Observatory (16%); present a guide of use (14.67%); have a navigation map (12%) and with the same percentage that the platform is usable with intuitive navigation. And finally, the Digital Observatory bid in different languages (4%).

In the case of item 9: What aspects related to the management beliefs should be seen in a research observatory MOOC? ; it might be mentioned that 19 experts indicate that the incidence resolution service should be considered in aspects relating to the management of a research observatory MOOC. For their part, 14 specialists indicate that public information about the research team needs to be reflected. In addition four of them, show that the suggestion box is another aspect to be taken into account. Moreover, three experts said that the rules of behavior on the Internet (Netiquette) are relevant in management. Finally, the FAQ, the quality commitments together with the opinion on the information presented are interesting elements in the management of a digital research observatory.

In the last related question about other aspects that could be taken into account, stands out the presentation of Reports, research and publications on the subject MOOC (40%), along with the display of information updates on offers of new MOOC courses (28%) ; Forums (20%) and with 4% should have a space on valuation by users together with a periodic evaluation and criteria for selection and evaluation of the selected MOOCs.

Finally, and not to exceed the length of the article, it is indicate that in relation to the second Delphi study begun on November 17, 2015 , and ended on March 10, 2016. In this study, the statistical results were presented together with the new questionnaire derived when analyzing the results of the qualitative contributions of the 20 experts of the first Delphi study, performing a similar statistical analysis of the first questionnaire. Ultimately, in Table 5





the final version of educational assessment tool Observatories® Digital CUVOMOOC are shown, to gather information on the development of digital Observatory MOOCservatorio®. In this sense, it is composed of four dimensions, the first one deals with the identification aspects (name, institution, sponsors, e-mail ...), which must have an observatory on MOOC (9 items). In the next dimension curricular elements such as objectives observatory structuring content, among other scientific reports valued (20 items). The third reference is made to reflect the technical and functional characteristics that must have a research observatory on MOOC (14 items), and the last estimated administrative and management environment Observatory, that is, equipment management and maintenance of web environment (3 items).

DIMENSIONS	ÍTEM	ÍTEM	
IDENTIFYING ISSUES	• Name MOOC Observatory.	A1	
	• MOOC coordination team Observatory.	A2	
	• Institution or organization sponsoring the MOOC Observatory	A3	
	• MOOC sponsors Observatory.	A4	
	• Disciplinary field of MOOC Observatory.	A5	
	• Potential recipients of the MOOC Observatory.	A6	
	• MOOC Observatory web address.	A7	
	• Email contact MOOC Observatory	A8	
	• Available languages MOOC Observatory	A9	
TEACHING	• Information is necessary for the Observatory on MOOC show the mission / objectives of a clear and meaningful way.	B1	
	• Suitably, the contents of the information Observatory MOOC are distributed in sections or modules, according to the subject to which they belong.	B2	
	• Information is necessary for the Observatory on MOOC count on the following sections.	• What is the MOOC Observatory? (Objectives, mission...).	B.3.1.
		• Breaking News.	B.3.2.
		• Events (conferences, seminars, conferences...).	B.3.3.
		• Research (reports, case studies ...).	B.3.4.
		• MOOC courses directory.	B.3.5.
		• News bulletin.	B.3.6.
		• Seeker.	B.3.7.
	• Forum.	B.3.8.	
	• It is pertinent that the contents of the information Observatory on MOOC are structured starting from the simplest to the most complex, presenting a progressive complexity, with increasing levels of depth, to enhance meaningful learning.	B.4.	
	• Information on the contents of the Observatory on MOOC should be used in a writing style carefully, using a few short paragraphs to express ideas and offer a guide to the Observatory and the information contained therein.	B.5.	
	• Information on the contents of the Observatory on MOOC should be used in a writing style carefully, using a few short paragraphs to express ideas and offer a guide to the Observatory and the information contained therein.	B.6.	
	• The style of language used in the Information Observatory on MOOC should be direct, cordial, motivating and circumventing any segregation, whether for political reasons, race, sex, religion, etc.	B.7.	





<b>TEACHING</b>	<ul style="list-style-type: none"> <li>The information provided should be concrete, relegating the most extensive and detailed information through links to additional pages.</li> </ul>	B.8.
	<ul style="list-style-type: none"> <li>MOOC informative Observatory shall submit an agenda or schedule information of upcoming scientific events on MOOC.</li> </ul>	B.9.
	<ul style="list-style-type: none"> <li>The informational Observatory on MOOC must have a Newsletter and / or journal periodically to communicate about relevant events related to the MOOC.</li> </ul>	B.10.
	<ul style="list-style-type: none"> <li>One needs to be provide in the Information Observatory on MOOC a glossary to facilitate understanding of the information contained therein.</li> </ul>	B.11.
	<ul style="list-style-type: none"> <li>It is necessary that the possibility that the learner incorporate new knowledge to the Information Observatory on MOOC is offered.</li> </ul>	B.12.
	<ul style="list-style-type: none"> <li>MOOC informative Observatory shall submit collaborative networks, discussion groups and / or forums on the theme of the observatory itself.</li> </ul>	B.13.
	<ul style="list-style-type: none"> <li>Information is necessary for the Observatory on MOOC available guidance material on standards of living / cordiality for discussion groups.</li> </ul>	B.14.
	<ul style="list-style-type: none"> <li>The informational Observatory on MOOC must have a virtual space where answers to the most frequently asked questions (FAQ - give Frequently Asked Questions).</li> </ul>	B.15.
	<ul style="list-style-type: none"> <li>It is pertinent that the information available on MOOC Observatories can be found on conceptual schemes, maps of ideas, flowcharts, etc., to facilitate understanding of the contents therein.</li> </ul>	B.16.
<b>TECHNIQUE</b>	<ul style="list-style-type: none"> <li>MOOC informative Observatory should incorporate a search engine content.</li> </ul>	C.1.
	<ul style="list-style-type: none"> <li>MOOC informative Observatory should include tutorials (in video format, presentations, simulations...) as a guide for use and / or help to solve any technical problems.</li> </ul>	C.2.
	<ul style="list-style-type: none"> <li>In the information MOOC Observatory should be provided the opportunity to download and print reports and newsletters exposed.</li> </ul>	C.3.
	<ul style="list-style-type: none"> <li>The textual information Observatory on MOOC information should be organized through hypertexts.</li> </ul>	C.4.
	<ul style="list-style-type: none"> <li>The textual information environment Observatory MOOC must be legible, static, avoiding excessive capitalization, with alignment of text on the left and with a balanced contrast with the background (background).</li> </ul>	C.5.
	<ul style="list-style-type: none"> <li>The informational Observatory on MOOC must have an RSS that allows subscribing to published news, events, etc.</li> </ul>	C.6.
	<ul style="list-style-type: none"> <li>Icons and images used in the Information Observatory on MOOC should be easily recognizable and there should be similarity between the image and the function it represents.</li> </ul>	C.7.
	<ul style="list-style-type: none"> <li>Observatory in the information should be used MOOC contrast in color to highlight key concepts and words as an aid to reading content.</li> </ul>	C.8.
	<ul style="list-style-type: none"> <li>In the information Observatory MOOC a visual, conceptual and seaworthiness, is held to, and so consistency is maintained so that the learner will be quickly familiar with the contents.</li> </ul>	C.9.
	<ul style="list-style-type: none"> <li>Multimedia design must be uniform, friendly, usable and intuitive, so that as user one becomes familiar with it in a short period of time.</li> </ul>	C.10.
	<ul style="list-style-type: none"> <li>Observatory in the information MOOC bulleted lists and similar design elements to highlight the significance of the text will be used.</li> </ul>	C.11.





<b>TECHNIQUE</b>	<ul style="list-style-type: none"> <li>In the sought structure information sections Observatory MOOC no more than three levels of nesting should be employed.</li> </ul>	C.12.
	<ul style="list-style-type: none"> <li>The Observatory on MOOC information should provide a navigation map or global web map from which one is allowed to access any section.</li> </ul>	C.13.
	<ul style="list-style-type: none"> <li>MOOC Observatory informative visual guides shall be presented to guide the learner to navigate and determine which section is exactly (breadcrumb).</li> </ul>	C.14.
	<ul style="list-style-type: none"> <li>The graphical environment information Observatory MOOC should avoid using any flashing or blinking elements often high (more than 3 times / sec.) to prevent fatigue, discomfort or onset of disorders photosensitive as epilepsy.</li> </ul>	C.15.
	<ul style="list-style-type: none"> <li>MOOC informative Observatory will enable access platform and multi - devices.</li> </ul>	C.16.
	<ul style="list-style-type: none"> <li>MOOC informative Observatory should have a section or module to send messages about complaints, suggestions and / or proposals for improving the observatory itself.</li> </ul>	C.17.
<b>ORGANIZATION</b>	<ul style="list-style-type: none"> <li>The informational Observatory on MOOC must have enabled a space to present and describe the existing management team.</li> </ul>	<b>D.1.</b>
	<ul style="list-style-type: none"> <li>The information Observatory MOOC must have a space where is present equipment maintenance platform.</li> </ul>	<b>D.2.</b>
	<ul style="list-style-type: none"> <li><b>The informational Observatory on MOOC must have an urgent care service that meets the users' needs in exceptional cases.</b></li> </ul>	<b>D.3.</b>

Table 5. Dimensions and the items of the initial version of the instrument CUVOMOOC®.

**RESULTS OF PHASE 3: Telematics Implementation of the initial version of the new digital MOOC Research Observatory registered in the Patent and Trademark Office entitled: MOOCservatorio®.**

In the first instance, to implement the web portal MOOCservatorio®, it was decided to use a CMS (Content Management System - content management system), since a system of this kind, in front of a web in plain HTML, would provide greater potential and offer a greater number of configuration options and the ability to create different access profiles, both public and restricted for people who use mode, manage or would administer the portal in the future, facilitating the creation and management content. In turn, we opted for Joomla! as the ideal and optimal development of this research project CMS. Also, for the implementation of content management system the latest version (it will download Joomla! 3.7 at the time of writing) from the official site ([www.joomla.org](http://www.joomla.org)). The installation was carried out or a Virtual Private Server (VPS)<sup>1</sup> managed by the German multinational Hosteurope and located in London (UK). The VPS has 100 GB of web space, dedicated IP Spanish, 4Gb of RAM and dynamic traffic and allows a transfer rate without limitation. The VPS is administered using CPanel and WMH, has installed an Apache web server module for PHP language and database manager MySQL which equal or exceed the requirements of the versions of Joomla! Used.





Once installed and a previous study conducted by the relevant technology experts Group EduInnovagoría (HUM-971): <http://bit.ly/1sGHwqO> a web template is designed using corporate colors and brands previously designed. Regarding such a design, it should be noted that web design has taken a responsive or adaptive frame, which allows for the correct visualization of the same website on different devices (from desktop to tablets and smartphones).

Through this technique interface reshapes different elements so that they adapt to the width of each device, allowing proper viewing and also a better user experience is thus allowed. The responsive design reduces loading time, overcomes duplicate content, and increases viral content because it allows these to be shared more quickly and naturally. In addition, from the point of view of SEO (search engine optimization), with this technique there is a unique URL in the research results, thus avoiding multiple redirections and thus avoiding possible failures derived from these. Errors accessing the website are avoided by social links, links that visitors share on social networks and can cause errors if they are accessed from the same type of device with which it was created (for example, by creating the link from a computer and accessed from a smartphone). Concerning which design elements were explored, web portal interface was taken as reference for the results of phases 1 and 2. Based on these results, the structure of the interface developed MOOCservatorio® as detailed below, which is shown graphically in Figure 4.

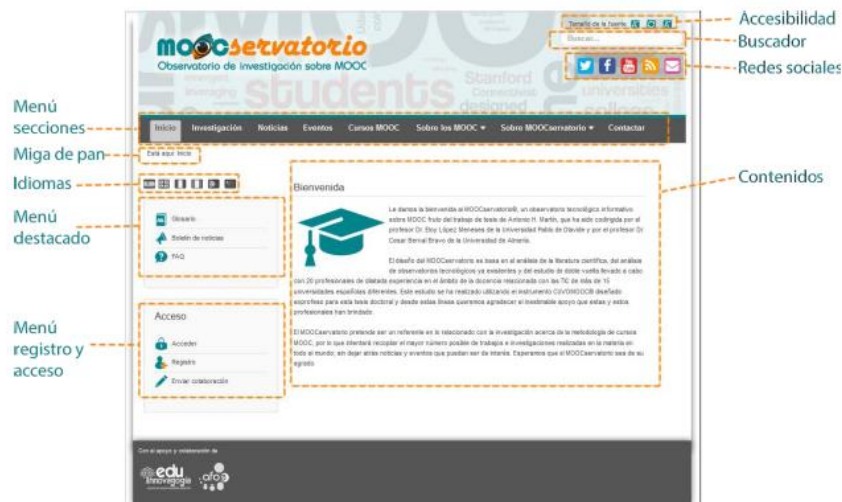


Figure 4. Structure of the graphical interface MOOCservatorio®.

As shown in the above figure and more descriptively in Figure 5, in the top right they have placed some elements that allow interaction with the website.





Figure 5. Detail Web interface. right upper zone.

On the one hand there are selectors' text sizes that are intended to facilitate web accessibility for people with a visual impairment. With these selectors one is allowed to change the text size, both to enlarge and to reduce it, and to return to the initial state.

At the bottom of these selectors size has located a quick search engine that quick searches can be performed on the website. To search one enters the term, or search terms to perform, and then one presses enter on the keyboard.

Just below the search engine is the Social Portal menu (Figure 6) in which shortcuts to profiles that include MOOCservatorio® operates in different social networks and has access to RSS<sup>2</sup> website. Between social networks indicated by experts in the CUVOMOOC® are Twitter®, Facebook® and YouTube®. Included is also a link to the RSS portal to facilitate syndication, as well as a shortcut to a website contact portal.



Figure 6 . Social Portal menu.

In the bottom of the header MOOCservatorio® is the Main Menu of the portal. Through this menu can be accessed the main website sections: research, news, events, information on MOOC courses, information on the MOOC, information about the MOOCservatorio® and a link to the contact form. Once access to a section is selected it will appear in a light gray color to facilitate location for people visiting the web

To facilitate navigation through the web portal, some sections have been divided into different subsections. For access to these subsections and to render them faster and more convenient, drop-down menus have been integrated into these categories. As shown in Figure 7, clicking on a configured drop-down menu displays a popup in which the content can be accessed as an organized element.



Figure 7. Main Menu MOOCservatorio® with deployed section.

At the bottom of the main menu just described, is an element in the computer field called breadcrumb (English breadcrumb) or breadcrumb (French fil d'Ariane). It is a navigation element, common in graphical user interfaces and web pages, shown as a line of text in the location into sections and subsections in which the person visiting the website is shown. Navigates through said sections one can return to previous navigation items by clicking on the links that are provided (Figure 8).



Figure 8. Example of navigation element "crumb" of MOOCservatorio®.

On the left side of the interface of the website, under the breadcrumbs, area menus are available. First, one uses the language menu. Through this menu one can access the contents of MOOCservatorio® in different languages. In this way one allows access to content developed people who do not know the Castilian language. Translation languages offered are English, French, Italian, Portuguese and Chinese. To implement this functionality has been used API<sup>3</sup> applies Google®.

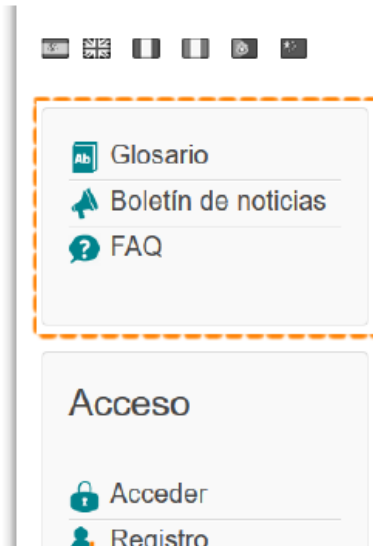


Figure 9. Featured elements menú.

Below the language menu is the menu highlights (Figure 9). A tool which will find shortcuts to items that may be useful or relevant to the experience of access to MOOCservatorio® as pleasant as possible.

In this menu highlights items such as a glossary of terminology are integrated. This glossary is listed alphabetically organized through tabs. Just click the mouse in a letter to the defined terms beginning with that letter is displayed.

In the same menu you can find access to subscribe to the newsletter to be sent periodically from the MOOCservatorio®.

The same newsletter serves to carry out the subscription as the rules on the treatment of personal data sets (Figure 10).



Figure 10. Newsletter subscription of MOOCservatorio®.

Also, in this menu, but in the future more elements that may be useful are incorporated, are the FAQ (Frequently Asked Questions) or FAQ. A list of questions and answers about issues related to MOOCservatorio® and utilization. To implement this functionality has been used a token system presented in accordion format. That is, a list of questions appears and clicking on the title of the question at issue explanatory text in reply unfolds. Clicking on another question the text above folds and corresponding to the relevant question text appears.



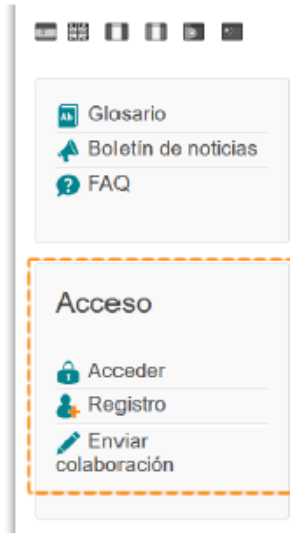


Figure 11. Menu Access users MOOCservatorio®.

Finally, on the Right side you can find the menu user access (Figure 11). Through this menu, anyone who visits the MOOCservatorio® could thus register for credentials (username and password) with which to access restricted areas of the MOOCservatorio®. To prevent malicious users from accessing restricted areas such registration is not automatic. The person concerned must first make contact by email with the address of MOOCservatorio®, and send a resume that can be contrasted and determine that the person can collaborate with research observatory on MOOC. Likewise one must register via online form.

Once the person is registered and such registration has been validated and accepted by the administrator of the website, one can follow ACCESSING inside this menu link. This takes one to a login form where one needs to insert the username and password provided previously. If the person did not remember the password or the username, one may request access to the system that would recall both of these parameters. If one were asked a contact email that should match any of the existing records, send an email requesting confirmation password reset or user. If confirmed automatically one enables in this way a form to update credentials.

Ultimately, if the person has an active user Access menu, it will include new exclusive features for the role assigned to it. Among other issues, one can access his or her personal profile and change some parameters (email associated with the account, passwords, etc.). One can also submit a collaboration site. One will have to fill in the fields indicated and one has a complete text editor with which to format text (bold, italic, indents, etc.) and insert tables, insert images, videos, etc. Any collaboration, especially in the case of basic access roles, will be moderated before it is finally published. That is, the person in question, will ship their collaboration and the management team will review the submitted work, being able to modify, approve or deny their participation

Followed by the last phase of the research addresses.



*RESULT OF PHASE 4: Construction of the final version of MOOCservatorio® validated by expert judgment and operational virtual (final version).*

In the last stage interviews are analyzed by six teachers college, specialists in information and communications technology, stuff that imparts teaching, for validation of the final version of Digital Research Observatory MOOC. The purpose of this is whether the implementation of the aspects marked by the experts of the Delphi study, regarding the design of an Observatory Research MOOC has been successful, or whether they consider that it should be modified or some aspect specifically added to design MOOCservatorio®. Also, note that for the analysis of the transcripts of the s interviews, guidelines for analyzing qualitative data were used Charmaz (2006) and patterns, and trends and large groups were determined.

Then perceptions and global input from key informants is synthesized.

In the first instance, with respect to identifying elements, with 66.66% of respondents considered of interest that the information on work teams are reorganized, integrating all information into a single page, and are taken into account in the final version of the Observatory. Furthermore, in accordance with 33.33% of the experts this information will also be added through deployable means, and by incorporating a flowchart in which can be seen clearly the composition of the different teams (team coordination, technical equipment and management team).

Among the most relevant aspects mentioned by experts regarding the didactic dimension, the following are highlighted:

- A high percentage of experts indicated that it was necessary to include a feedback system in content articles (66.66%) and in voting or valuation of these articles (50%), in this sense, it is considered relevant and inserted into the final version of the Observatory.
- Moreover, 88% of respondents stated that the visibility of the virtual environment will be increased by adding other social networks. As for us, it is considered relevant and will be included in the final version of MOOCservatorio®.
- Key informants also noted that it would be advisable to unify the sections News & Events (50%) in this regard, and will be amended in the final version of the Observatory research MOOC.
- Ultimately, ICT experts, although in a minor form (16.66%), indicated the incorporation of a QR code on the articles; in this case it is considered more optimal and effective usability a workspace insert, a unique code QR on the home page, that addresses the main web address of MOOCservatorio® (<http://moocservatorio.com/>).

As for the technical dimension, 33.33% of respondents recommended improving the accessibility of MOOCservatorio® certification performing the W3C which requires a web design expert accessibility to make some technical changes in the management system content which will be considered as a line of improvement in the future. Also, add a sidebar to the immersion of a module news highlights and latest news as assessed by 33, 33% of experts.



Finally, as to the last dimension, 83.33% of key informants considered timely and sufficient valuations reached by the experts in the Delphi study so they have not made any contribution related to the organizational dimension. Only in accordance with the opinion of a key informant (16.66%) making contact forms differentiated work area deem it necessary. In turn, one performed a methodological triangulation to acquire greater knowledge and understanding of the subject matter, i.e., the data obtained through the different results obtained from both methods were analyzed holistically. To this end, one compiled the results of the quantitative study through the questionnaires that were used for the Delphi studies applied to twenty experts, whose result was the teaching tool for assessing Observatories MOOC called: CUVOMOOC® with related dimensions the educational, technical and organizational aspects. This information serves as a framework reference for the first initial release of the Observatory research MOOC: MOOCservatorio®. Subsequently, one made a qualitative study, namely six interviews with university teachers teaching in subjects related to information and communications technology were applied. These experts were in charge of validating the final version of MOOCservatorio®, corroborating after transcription that these experts interviewed agreed with the telematic overall design of the Observatory research on MOOC, and therefore with elaborate dimensions, which were considered suitable. In short, once this triangulation with different methods of enriching and understanding the same object of study, it can be concluded that the Observatory research on MOOC: MOOCservatorio® is suitable and functional for knowledge creation and dissemination of information on the open field of MOOC for the scientific community in particular, and to the general public.

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<sup>1</sup> A virtual private server (VPS, English virtual private server) is a method of partitioning a physical server into multiple servers so that everything runs as if it were running on a single machine. Each virtual server can run on its own operating system and also each server can be independently rebooted.

<sup>2</sup> RSS (Really Simple Syndication) is an XML format for syndicating or share content on the web. It is used to disseminate updated to users who have subscribed to the source of content information. The format allows one to distribute content without a browser, using software designed to read these RSS contents.

<sup>3</sup> API (Application Programming Interface) is the set of subroutines, functions and procedures (or methods in object - oriented programming) provided by certain libraries for use by other software as an abstraction layer.

