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Facultad de Ciencias Sociales y Humanas

Knowledge-based society and Innovation in the new cultural spaces: an approach from the digitised museums

Programa: LAS CIENCIAS HUMANAS EN LA SOCIEDAD DEL CONOCIMIENTO

Tesis doctoral presentada por Don Ion Gil Fuentetaja

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El Doctorando

UNIVERSIDAD DE DEUSTO

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Ion Gil Fuentetaja

Donostia-San Sebastián,

octubre de 2011

Abstract in Spanish

La presente tesis doctoral aborda el estudio de la implementación de las tecnologías web por parte de los museos y el uso de estos recursos que hacen sus visitantes virtuales. La introducción de tecnologías en actividades cotidianas y la irrupción de la Sociedad del Conocimiento han transformado numerosos procesos sociales, entre otros los referentes a la participación ciudadana y a los patrones de consumo de contenidos en la web. Este impacto se ha visto reflejado en los diferentes ámbitos de actividad social y, en particular, en lo concerniente a la cultura, desde las políticas culturales se identifican importantes ajustes para dar respuesta a las necesidades actuales.

Ante la imposibilidad de abordar todo el espectro de transformaciones, esta tesis se centra en el impacto en el sector cultural y, más específicamente, en los museos. El sector cultural, en su totalidad, se enfrenta al reto de readaptar sus estructuras y esquemas de funcionamiento a una nueva situación tecnológicamente mediada. En este sentido, los museos han estado recientemente digitalizando y convirtiendo sus contenidos culturales accesibles en Internet. De acuerdo con la literatura, la filosofía de comunicación de los museos influye en la manera en que los contenidos son presentados al usuario final. Sin embargo, se carece aún de una comprensión holística de la adopción e impacto de la tecnología en el ámbito cultural, sobre los contenidos digitales culturales y museísticos.

En este contexto genérico, la presente tesis afronta el tema desde una doble perspectiva completamente interrelacionada. Por una parte, el primer fragmento de la investigación lleva a cabo un análisis exhaustivo de páginas web de museos de Alemania, España, Estados Unidos, Grecia y Reino Unido presentes en el directorio de la Biblioteca Virtual de Museos del ICOM. Dicho análisis consiste en la identificación de las características y secciones generales de las colecciones digitales de cada página web. Tras el examen de cada página web, se ha llevado a cabo un proceso de agrupación para determinar si existen diferentes modelos arquetípicos de comunicación de los contenidos culturales digitales por parte de los museos y si responden a los modelos teóricos propuestos por la literatura.

Por otra parte, los museos hacen sus contenidos accesibles para que los visitantes virtuales puedan utilizarlos con diferentes propósitos. Por consiguiente, el comportamiento de los

visitantes en el entorno web de los museos es vital para la comprensión de la situación actual. En este sentido, la investigación ha abordado el tema desde una doble perspectiva. En primer lugar, los usuarios de una página web han sido considerados globalmente, para identificar patrones generales de uso. Para esta parte de la tesis, se han utilizado los weblogs del Museo Benaki (Grecia), Museo Diocesano y Regional de Lleida (España) y Museo Pitt Rivers (Reino Unido). Este análisis ha identificado diversos modelos generales de utilización de las páginas web por los visitantes virtuales. Adicionalmente, esta tesis también ha analizado los usuarios desde una perspectiva individual para identificar potenciales modelos genéricos de usuarios. Para esta parte del análisis, se han utilizado los weblogs individuales de los usuarios de la sección de las bases de datos de la página web del Museo Pitt Rivers. Este apartado de la tesis ha identificado algunos modelos genéricos de usuarios virtuales de la sección de las bases de datos, basados en su comportamiento y utilización de los recursos presentes.

Los resultados obtenidos de la investigación sugieren que existen modelos genéricos tanto de filosofías de comunicación web e implementación de tecnologías web por parte de los museos, como de comportamiento de los usuarios en estos entornos tecnológicos. Finalmente, a partir de estos resultados, la tesis subraya ciertas implicaciones para futuras investigaciones e implementaciones tecnológicas con contenidos culturales, incluyendo el diseño y planificación de las políticas culturales. Esta tesis realiza aportaciones sobre el rol de la cultural en la Sociedad del Conocimiento y proporciona respuestas al fenómeno complejo global del uso de tecnologías web con contenidos culturales por los museos y los visitantes virtuales, en particular.

Abstract in English

The present thesis addresses the study of the implementation of web technologies by museum and the use of these resources by final virtual visitors. The introduction of technologies in daily life and the irruption of the Knowledge Society have transformed most of the processes of society, the ones referring to citizens' participation and consumption patterns of contents on the web, among others. This impact has been reflected in different social activity ambits and, particularly, concerning culture, from the viewpoint of the cultural policies important adjustments have been identified that seek giving answer to current needs.

Unable to deal with the whole spectrum of transformations, this thesis focuses on the impact on the cultural sector and, more specifically, on museums. Cultural sector, as a whole, faces the challenge of readapting its structures and functioning schemes to the new technologically-mediated situation. In this sense, museums have recently been extensively digitizing and making their cultural contents available on the Internet. According to literature, the philosophy of communication of museums influences the way contents are presented to the final users. However, there is no holistic understanding of the adoption and impact of technology in the cultural realm, on cultural and museum digital contents.

Within this generic framework, the present thesis tackles the issue from a double interrelated perspective. On the one hand, the first part of the research makes an exhaustive analysis of websites of museums from Germany, Greece, Spain, the United Kingdom and the United States of America present on the Virtual Library of Museums directory of ICOM. This analysis consists of the identification of the general features and sections available on the digital collection of each website. After the examination of all these websites, a clustering process has been performed to determine whether there are different archetypical models of communication of cultural digital contents by museum and if they respond to the theoretical models proposed by literature.

On the other hand, museums make their contents available so that virtual visitors can access them for diverse purposes. Consequently, the behaviour of the visitors within the web environment of museums is central for the understanding of the current situation. In

this sense, the research has dealt with the topic from a twofold perspective. First of all, users of a website have been considered globally, in order to identify general patterns of use. For this part of the thesis the weblogs from the Benaki Museum (Greece), the Diocesan and Regional Museum of Lleida (Spain) and the Pitt Rivers Museum (United Kingdom) have been used. This analysis has identified different general models of use of the websites as a whole by virtual visitors. Additionally, this thesis has also examined them from an individual perspective to identify potential generic models of users. For this part of the research the individual weblogs of the users of the database section of the website of the Pitt Rivers Museum have been used. This part of the thesis has identified some generic models of virtual users of the database section, based on their behaviour and utilization of the resources.

Results obtained from the research suggest that there are some generic models of both web philosophy of communication and implementation of web technologies by museums, as well as of behaviour of users on these technological environments. Finally, arising from these results, the thesis highlights some further implications for future researches and technological implementations with cultural contents, including design and planning of cultural policies. The thesis brings in some insight on the new role of the cultural endeavour in the Knowledge Society and provides some answers for the global complex phenomenon of use of web technologies with cultural contents by cultural institutions and virtual visitors, in particular.

Abstract in Basque

Honako tesiak museoen web teknologien inplementazioaren eta bisitari birtualen baliabide digital hauen erabileraren ikerketa darama aurrera. Eguneroko bizitzan teknologien erabilerak eta Ezagutzaren Gizartea indarrean sartu izanak gizartearen prozesu asko eraldatu ditu, hiritarren partehartzea edota web edukien kontsumo patroiak, besteak beste. Eragin hau gizarte jardueraren esparru desberdinetan islatu da eta, bereziki, kulturari dagokionez, kultur politiken ikuspegitik egungo beharrei erantzuna emateko ezarritako aldaketa esanguratsuak identifika daitezke.

Aldaketa guztiak tratatzeko ezintasunarengatik, tesi hau kultura sektorean eta, konkretuago, museoetan egondako inpaktuen neurketan zentratzen da. Kultur sektoreak egungo teknologikoki mediatutako egoera berriari aurre egiteko estruktura eta funtzionamendu eskemak egokitzeko erronka du. Zentzu honetan, museoek era estentsibo batean beraien eduki kulturalak digitalizatu eta Interneten eskuragarri jartzen dihardute azken aldian. Literaturaren arabera, museoen komunikazio filosofiak edukiak azken erabiltzaileei aurkezteko moduan eragina dauka. Dena den, egun ez dago web teknologien adopzio eta inpaktuari buruzko ulermen holistiko argirik arlo kulturalean, eduki digital kultural eta museistikoei dagokienez.

Esparru honetan, tesi honek erlazionatutako bi ikuspegi desberdinetatik lantzen du gaia. Alde batetik, ikerketak ICOMeko Museoen Liburutegi Birtualeko direktorioan agertzen diren Alemania, Erresuma Batua, Espainia, Estatu Batuak eta Greziako museoen web orrien azterketa sakon bat egiten du. Analisi hau web orri bakoitzaren bilduma digitaleko sailaren karakteristika eta atal orokorren ikerketan datza. Web orri guzti horien analisiaren ostean, klusterizazio prozesu bat eraman da aurrera, museoen eduki kultural digitalak komunikatzeko modelo arketipiko desberdinak dauden eta beroiek literaturak proposatutako modelo teorikoei erantzuten dieten argitzeko.

Bestalde, museoek beraien edukiak eskuragarri jartzen dituzte bisitari birtualek helburu desberdinetarako erabil ditzaten. Beraz, gaur egungo egoera ulertu ahal izateko, beharrezkoa da museoen web ingurunean bisitariek duten jokaera ezagutzea. Zentzu honetan, ikerketak gaia bi ikuspuntu desberdinetatik aztertu du. Lehenik eta behin, erabilera

patroi jeneralak identifikatu ahal izateko, web orri bateko erabiltzaileak oro har kontsideratu dira. Tesiaren atal honetarako Benaki Museoa (Grezia), Lleidako Museo Diozesiar eta Erregionala (Espainia) eta Pitt Rivers Museoak erabili dira. Analisi honek web orrialdeen erabilerari buruzko modelo orokor desberdinak zehaztu ditu erabiltzaileak oro har kontsideratuta. Era berean, tesi honek ikuspegi indibidual batetik ere aztertu ditu, erabiltzaileen modelo generiko potentzialak identifikatu nahian. Ikerketaren sail honek Pitt Rivers Museoko web orriko datu base ataleko erabiltzaileen weblog indibidualak aztertu ditu. Atal honek datu base sailaren erabiltzaile birtualen hainbat modelo generiko identifikatu ditu, beraien jokaera eta errekurtsoen erabileran oinarrituta.

Ikerketan lortutako emaitzek bai museoen web komunikazio filosofi eta web teknologia inplementazioari eta baita ingurune teknologiko hauetan erabiltzaileen jokaerari ere dagokionez hainbat modelo generiko daudela iradokitzen dute. Azkenik, emaitzetan oinarrituta, tesi honek etorkizuneko ikerketa eta eduki kulturalekin inplementazio teknologikorako hainbat inplikazio azpimarratzen ditu, politika kulturalen diseinu eta planifikaziorako inplikazioak barne. Tesiak Ezagutzaren Gizartean kulturaren paperari buruzko ekarpenak egin eta instituzio kulturalek eta, partikularki, bisitari birtualek eduki kulturalekin egiten duten web teknologien erabileraren gai orokor konplexuari buruzko hainbat erantzun ematen ditu.

Acknowledgements

The present thesis is the result of an academic career that started when I began to study History – Cultural Heritage at the University of Deusto in Donostia, in which I have also fulfilled my doctoral studies. Anyway, I would also like to convey my gratitude to the Museology Laboratory of the University of the Aegean in Mytilini (Greece), where I spent nearly two years developing a great part of this research as a Marie Curie Early Stage fellow within the framework of the wider research network *CHIRON - Cultural Heritage Informatics Research Oriented Network 2005-2008*, which was supported by the European Community's Sixth Framework Programme under contract number MEST-CT-2004-514539. The second year of my stay in Greece was funded by a grant of the General Secretariat for Research and Technologies of the Ministry of Education, Lifelong Learning and Religious Affairs of the Greek Government. I want to express my gratitude to all these institutions for their infrastructure and financial support to successfully perform the research.

Obviously, I would like to acknowledge the museums that have taken part on the second stage of the research. This research could not have been possible without the disinterested provision of data and collaboration of the staff of the Benaki Museum, the Òliba Group of the Universitat Oberta de Catalunya on behalf of the Diocesan and Regional Museum of Lleida and the Pitt Rivers Museum. I would expressly like to thank Haas Ezzet, head of the ICT of the Pitt Rivers Museum, for the help provided on the understanding of the weblogs of the database section of the institutional website.

In the personal sphere, I would first like to thank Dr. Aurkene Alzua Sorzabal, because she has been walking this long way together with me from the very beginning. Through all the different stages of the research process, her advice and supervision have been crucial for the successful accomplishment of this thesis. Her collaboration has backed up my process of intellectual maturity that has finished with the elaboration of this thesis.

Similarly, it is essential for me to acknowledge the inestimable help of Dr. Maria Economou. I have to thank her from both the academic and the personal perspective. On the academic ambit, she has provided me with another point of view on the issues related to museums and collections in current days, as well as with the opportunity to interact with

experts from our and other fields in the framework of the CHIRON network. From the personal viewpoint, she has given me the opportunity to live nearly two years in Greece and become part of a very different culture, which has happened to be a very important part of my being. Words fail me to express my appreciation to her for this particular aspect.

During all these years, I have been surrounded by incredible job colleagues. All of them have been a very supportive part of all the research process. At the initial stage of delimiting the research project, I was part of the *eK+i, Culture, Development and Innovation in Europe* research team of the University of Deusto and my research mates were witnesses of joys and frustrations. I want to thank them for becoming an important pillar during these initial times.

When I was developing the thesis in Greece, the Museology Laboratory of the University of the Aegean in Mytilini became my second home. There I coincide with two very special officemates; Laia Pujol, with whom I shared some very interesting academic and non-academic conversations, and Lavina Shahani, my cheerful office chilling music and after-work relaxing moments' partner. When the job was getting too hard for our Greek way of life, they were always there to give me an escape way.

Finally, when the thesis was on its last stage, I started working at the Centre for Cooperative Research in Tourism – CICtourGUNE, where I have found not only a very efficient and competitive working team, but also a very reliable human group that has given me the support I needed during the final hard moments. Thank you for teaching me that working can be easily accompanied by moments of joy and lots of laughs.

Όπως έλεγα πριν, η Ελλάδα είναι πια ένα πολύ σημαντικό μέρος της ζωής μου. Όταν πρωτοπήγα στην Ελλάδα, δεν μπορούσα να φανταστώ πως όλη μου η ζωή θα άλλαζε για πάντα. Ένας καινούργιος Ιόν γεννήθηκε στη Μυτιλήνη. Κι όλοι σας θα μείνετε για πάντα στην ψυχή μου. Μια αξέχαστη παρέα, αμέτρητες στιγμές γεμάτες γέλιο. Ευγενία, Μαρία, Πόπη, Χρύσα, η Ελλάδα δεν θα ήτανε ίδια για μένα χωρίς εσάς. Σας ευχαριστώ πολύ για τις όμορφες στιγμές, κούκλες μου!

Και βέβαια ο καινούργιος Ιόν έγινε ελληνάρας με τη βοήθεια των φίλων μου από το Φοιτητικό Χορευτικό Σύλλογο Ορφέα. Νατάσα, Ρίτα, Γεωργία, Φωτεινή, Γιώργο,

Κωνσταντίνε, Έλενα, Ιωσήφ, Άννα, Όλγα, και όλα τα παιδιά που δεν μπορώ να απαριθμήσω εδώ ήσασταν υπέροχοι. Πραγματικά δεν θα καταλάβαινα τι είναι η Ελλάδα αν δεν ήμουν μέλος του Ορφέα.

Μα, πάνω από όλα, θα ήθελα να ευχαριστήσω δύο συγκεκριμένα άτομα, το Λευτέρη Παπαδήμα και τον Παναγιώτη Φωτεινέα. Δυο πραγματικούς φίλους που δεν θα ξεχάσω ποτέ, οι οποίοι και με κάνατε να μάθω πού ανήκω εγώ. Η Λυσιστράτη, τα ταξίδια στη Ρόδο, στο Ναύπλιο και στην Αίγινα, ένα αξέχαστο Ελληνικό Πάσχα, τα βράδια στα σπίτια σας στη Μυτιλήνη και πάρα πολλά άλλα μικρά πραγματάκια θα παραμένουν μόνιμα στην καρδιά μου. Οι δυο σας αλλάξατε τη ζωή μου. Ο καθένας με τα δικά του χαρακτηριστικά γίνατε τα σημαντικότερα κομμάτια της Ελλάδας μου. Σας ευχαριστώ για όλα όσα έχετε κάνει για μένα.

Bestalde, ezingo nuke atal hau amaitu ibilbide osoan zehar bertan egon diren nire lagun guztiei eskerrak eman gabe. Nire koadrilako kideei, askotan, beharbada gehiegitan, nire "ezin dut, tesia amaitu behar dut" esaldia entzun baitute eta, halere, beti bertan egon direlako. Eskola Dantza Taldeko nire kide eta lagunei, behar nuenean momentu alai eta dibertigarriak biziarazi dizkidatelako dantza eta dantza artean. A mis compañeros de estudios universitarios, Cristina, Iosu, Leire, Patricia y Susana, porque hemos vivido experiencias inolvidables dentro y fuera de las aulas, especialmente en nuestra incursión por tierras germanas. Obviamente, me resulta imposible mencionar a todas y cada una de las personas que merecéis un agradecimiento, por lo que espero que sepáis que de todas maneras estáis en el espíritu de esta tesis. Aun así, hay una persona a la que quiero agradecer especialmente que me haya enseñado a vivir más el momento. Carpe Diem!

Como resulta lógico, mis últimos agradecimientos no podrían ser para otras personas que no fueran mi familia. Habéis sido el apoyo moral que necesitaba en los momentos más duros de todo este largo proceso e, incluso, en gran parte, la motivación de los instantes finales para acabar este extenso documento. A mi hermana Nagore, porque, aunque no me lo ha dicho, sé que ha sufrido lo indecible mientras me veía elaborar esta tesis casi sin descanso. A todos y cada uno de mis sobrinos, porque cuando estaba más cansado de todo este proceso me daban la vitalidad necesaria para seguir adelante.

Pero, sobre todo, quiero agradecerles todo a mi aita y a mi ama, porque sin ellos nada de esto hubiera sido posible. No solamente me habéis dado la oportunidad material de realizarme intelectualmente, sino que me habéis ayudado a desarrollarme como persona y llegar a ser quien soy actualmente. Uno callando y otra preguntando por cómo iba el desarrollo de la tesis, sé que los dos habéis sufrido incluso más que yo durante todo este tiempo. E incluso sé que ha resultado desesperante para vosotros el que no os haya sabido explicar de manera inteligible a qué me he estado dedicando todos estos años. Pero siempre habéis estado a mi lado y por eso quiero agradeceros todo el apoyo que me habéis brindado desde que me embarqué en este proceso. Esta tesis es tan vuestra como mía.

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Section 1.- Introduction

"Without a collective memory, we are nothing, and can achieve nothing. It defines our identity and we use it continuously for education, work and leisure. The Internet is the most powerful new tool we have had for storing and sharing information since the Gutenberg press, so let's use it to make the material in Europe's libraries and archives accessible to all"
(Viviane Reding, Information Society and Media Commissioner, 2004-2010)

1.1.- Objective and importance of the research

The present research approaches the role of the cultural sector in the Knowledge Society from the perspective of the communication of cultural digital contents by museums on their websites and the use of these resources by virtual visitors. The consolidation of the Knowledge Society has advanced jointly with the implementation of technological applications in daily life activities [Castells, 2002; Council of Europe, 1997]. Culture, as a very important part of societies, is also embedded in the new current technologically mediated juncture [Castells, 2002:51-52]. The transformation of all the associated processes is reshaping the whole cultural sector and museums particularly. These institutions have been extensively making their cultural contents available on the Internet by means of the digitisation of their physical assets during recent times [Cole, 2002; De Silva, 2003:1; Normore, 2003]. Users, similarly, are accessing the contents provided by museums on the virtual replicas of their physical institutions. The provision of the contents by museums through their websites, as well as the access to the resources by the virtual visitors are key elements in this new technologically mediated situation. It is a new context for cultural participation, participants and bring in new challenges for museums managers and cultural practitioners as a whole. Within this frame, the aim of this research is twofold: to enhance the models of philosophy of communication of museums and to better understand the

behaviour of virtual visitors within the new environment of culture in the Knowledge Society. Thus, it is expected that this research will shed some light on the issue of culture in the Knowledge Society from the perspective of the digitized museums.

Since the initial implementation of technological applications in the economic realm, information and knowledge have been gaining ground gradually on the networks of communication generated by the massive implementation of technologies [Castells, 2002:51-52]. This greater importance of information and knowledge in the digital domain has given a more central role also to cultural institutions in these networks. The easier and more global access to these informational assets has resulted in a development of not only the technological structures, but also the mental and attitudinal ones of the current Knowledge Society [Council of Europe, 1997:31-32; Jeffrey and Nayman (eds.), 2001]. Individuals have transformed their functioning schemes and mental structures in order to better adapt their behaviour to the processes of the new socio-technological juncture. Users are experiencing a greater informational power than ever before. Furthermore, due to the development of user centred applications, also the power of communication of individuals has increased significantly. The blurring of the time and space constraints has expanded the instantaneity and reach of the communication processes significantly [Castells, 2002:406; Arnoldus, 2009:6]. Consequently, these communication processes have gained importance in current societies.

Attending to other perspective of the present context, the cultural sector as an economic activity has also been reshaped by the implementation of technological applications. This massive implementation has brought creativity and innovation to the core of the production and distribution processes of culture related contents. Therefore, apart from the traditional cultural institutions, the new economic approach to the sector embraces creativity and innovation based culture related industries [KEA, 2006; KEA, 2009b]. This new line of analysis has been generically labelled as Cultural and Creative Industries and, according to the available information, this broad sector corresponds to a representative gradually growing part of the economy of the advanced societies. Thus, cultural related economic activities are highly crucial in current western societies, with museums still being the central institution of the traditional cultural sector.

As a consequence, if communication processes are evolving and cultural contents have become a vital part of society, the topic of the communication of these contents by means of technological applications is central to better understand the cultural activity. Delimited by this generic context, museums have a great communication power thanks to the evolvement of web technologies [Peacock, 2008a:346], but this new situation also poses original challenges regarding communication processes of cultural contents. The way institutions make their digital contents available for the audience is a reflection of both the web philosophy of communication of museums, as well as of the use of these resources by virtual visitors. This complex issue requires a theoretical reach and precise museum policies in order to allow a higher performance of museums in the current Knowledge Society. Thus, this research will also tackle the current state of the communication of cultural contents by museums on the present Knowledge Society.

1.2.- Theoretical and empirical approach

Within this general framework, the research approaches the generic issue of the implementation of technological applications with cultural contents from the perspective of communication and access to these resources.

This approach is based on the models of philosophy of communication expressed on the literature, which state that different ways of communicating the contents influence the general model of philosophy of the institution [Hein, 1998:25]. Bringing this theory to the web environment, the research assumes that the implementation of different features results in diverse models of web philosophy of communication. These models, anyhow, are not isolated approaches, but moderated by corporate, cultural, technological and political factors. Taking these two driving ideas as a basis, the research has identified two generic premises, namely, that different archetypical technological implementation models relate to different philosophies of communication, as well as that different national cultural values and corporate values moderate the philosophy of communication of the institution. These premises have been translated into operative null hypotheses dealing with the differences on the implementation of technologies by museums, the geographical origin and the type of institution.

For this part of the research, the designed sample consists of 219 museums identified on the Virtual Library of Museums of ICOM. This sample is useful to test the mentioned

hypotheses, even though it presents some limitations, because results represent this group of museums and further more global extrapolations should be made with caution. In fact, all institutions are embedded into the western concept of museums, which may differ from the one of other cultures. Data gathered manually from these websites have been tested by statistical methods in order to identify frequencies and combinations of web features, together with a clustering and factorial process to determine whether there are archetypical models of communication related to technological implementation.

Conversely, along with the way contents and resources are made available by institutions, the use by virtual visitors is crucial in the definition of the topic. Virtual visitors access and use resources according to their needs and expectations. In this sense, the last premise of the research states that users' behavioural patterns differ on websites of museums with different character and philosophies and their diverse features. This generic premise, equally to the previous part, has been translated into two working hypotheses that analyse users of a website globally and individually. This part of the research presents the peculiarity of having two different samples to address the research goal. The first one of them consists of three concrete museums that provided the reports on the activity of their websites for a time frame of twelve months. These institutions have been the Benaki Museum, the Diocesan and Regional Museum of Lleida and the Pitt Rivers Museum. The limitation of this sample is that reports provide already processed static information and the analysis that can be made is more limited. Anyhow, patterns of users of the websites as global entity have been identified for each institution. The analysis of this part comprises a description of the patterns of the museums and a comparison of the three of them.

When virtual visitors are analysed individually, the sample consists of 4,756 unique IP addresses accessing the database section of the Pitt Rivers Museum throughout a whole year. This broad sample has identified the patterns of use of a specific resource of a website, as well as different groups of virtual visitors clustered together by the use they made of the provided resources. In this case, as the access to the primary source of information was provided by the Pitt Rivers Museum. The limitation of the sample, which is common to all web users' analyses, is the impossibility to generate an exact relation between IP addresses and unique visitors. Nevertheless, the sample has been assessed as optimal to proceed with the work of this research and to test the last hypothesis. As far as the statistical methods applied in this part of the research, descriptive statistics and cluster

and factorial analyses have been used. In addition, an individual detailed path analysis has been performed with some selected IP addresses.

All the obtained results have been helpful to outline the web philosophy of communication and the access to the provided resources by museums and virtual visitors respectively in the current structures of the Knowledge Society.

1.3.- Structure of the thesis

For a better comprehension, the present research is structured in five different sections. Besides this explanatory introduction section, there are other four different ones, namely, the literature review, the design of the study, the findings of the research and the conclusions and further implications. This first introduction section identifies the main objectives of the research, along with the state of situation of culture and technologies in the current Knowledge Society. Similarly, it outlines the theoretical and methodological approach to the topic, in addition to the structure of the research.

Section two, which deals with the literature review, is also divided into two differentiated parts. The first one of them focuses on the role of culture in the current Knowledge Society. After a brief synopsis on the social development of the technological implementation, the research provides an overview on the technological applications. Additionally, in order to assess its true importance on the current society, the research describes the relationship between culture and economy, as well as the weight of the Cultural and Creative Industries on current economies. Finally, cultural planning has been at the heart of policy making processes for a long time and, therefore, the research explains the relationship between culture and policies, illustrating it with the example of the European Union. All these aspects determine the role of culture in the ongoing structures of the Knowledge Society.

The second part of this first section defines the central object of this research, which are museums. Once a review of some national definitions of museums has been done, the research adopts the one given by the ICOM as the operative definition. However, museums and collecting have been evolving throughout history until the current stage, along with the paradigm of communication. Consequently, this research has dealt with the change of the paradigm of communication from a unidirectional linear one to another

multilateral model. This change of communication has been backed by the gradual introduction of technologies on museums, whose transformations are analysed on this part of the research. Lastly, as an important part of all the communication processes, users are analysed regarding their behaviour on the web environments of museums. This concludes the overview of the central object of study of the present research and the literature review section.

The design of the study is explained on the third section of the research with an intertwined twofold perspective of the theoretical and the empirical framework. After having delimited the current state in the cultural realm and the philosophy of communication of museums, the research has identified the scarcity of studies dealing with the real use of technologies by museums to communicate and made digital cultural contents available to virtual visitors. According to literature, there are different philosophies of communication, which will be translated into diverse features implementation. Furthermore, the adoption of a philosophy of communication is not an isolated decision, because it is moderated by technological, cultural, corporate and political factors. Moreover, as they represent the final target of museums, users are also an integral part of the whole cultural system. Therefore, the incidence of the web philosophies of communication of museums has been theoretically defined from this integral perspective. Consequently, three premises have been identified by the research, dealing with differences and models of technological implementation by museums, the moderation effect of geographical origin and typology of institutions and the behaviour of users on websites of the museums. These premises have been equally translated into six different operative null hypotheses. The empirical framework of this section, besides, has identified the working variables and statistical processes used for each of the delimited parts of the research.

The results of the research are embraced by section four and structured according to the theoretical premises to be answered. The first part of this section centres on the analysis of the websites of museums and their philosophy of communication according to the established criteria. The research has identified some archetypical models of web implementation labelled by different philosophies of communication. This set of first phase analysis gives answer to the first premise of the research, which states that different archetypical technological implementation models relate to different philosophies of communication. Furthermore, differentiated analyses taking into account variables such as

country of origin and type of institution shed some light on the premise dealing with the moderating factors, which are social and demographic constructed. These analyses answer the second premise of the research, which states that different national cultural values and corporate values moderate the philosophy of communication of the institution.

The second part of the results section focuses on the behavioural patterns of visitors to the institutional websites of museums. There has been a twofold approach to the analysis of virtual visitors. On the one hand, considering visitors to the website of a museum as a global entity; on the other, as individual users of the database of the Pitt Rivers Museum. Thus, results of this analysis answer the last of the premises proposed by the research, which states that users' behavioural pattern differs on websites of museums with different character and philosophies and their diverse features.

Section five, the last one of this manuscript, focuses on the conclusions of the research. Along with a brief overview on the current state and conclusions reached by the research, this section outlines the general position of museums in the current Knowledge Society, as well as supplementary implications for cultural institutions, users and policy makers regarding the implementation of technological applications with cultural contents. To finalize, the present manuscript describes some further working lines that should be addressed by future potential investigations.

Section 2.- Literature review

2.1.- Culture in the current society

The role of culture in society is central, but there are still difficulties when trying to define and delimit the concept. After an approach to both anthropological and sociological perspectives of culture, the section proposes an operative definition, which not only includes cultural manifestations, but also the productive process of creating them. From this perspective, culture has a great value, apart from in abstract terms, also in more tangible economic ones. Thus, this section concludes with a brief overview on the different approaches to value of culture.

Culture plays a central role in recent social and technological developments [Council of Europe, 1997:15]. Be it explicitly or implicitly, culture has always been at the heart of any crucial change during humankind's history. Anyway, culture is one of the most difficult terms to be defined, since its meaning has evolved jointly with social and human development. In fact, different philosophical trends and scientific disciplines have defined this term sometimes even in a totally contradictory way. From the very first conception of culture as the opposite to all natural things, culture has been broadening its meaning and transforming in some sense into synonym of civilization. Nevertheless, these two different conceptions are no longer valid when talking about culture, since nowadays it embraces a more abstract definition, related to the configuration of peoples and groups of individuals. In fact, during the World Conference on Cultural Policies (1982), UNESCO declared

> *"that in its widest sense, culture may now be said to be the whole complex of distinctive spiritual, material, intellectual and emotional features that characterize a society or social group. It includes not only the arts and letters, but also modes of life, the fundamental rights of the human being, value systems, traditions and beliefs"* [UNESCO, 1982].

Consequently, culture can be characterized not only as the material expression of some ideas, because the ideas themselves are clear exponents of the culture in which they are conceived. Thus, culture acquires a nature of creation and communication of symbols of a society, ideas, values, etc. **Culture, from the adoption of this operative definition of UNESCO, means a state that not only includes arts and religion, but also institutions and practices of means and values**. That is why it is easily recognizable that culture has evolved from a tighter conception that included merely art expressions to a more ambiguous one adopted by cultural agents, where activities such as the leisure ones will also be included as part of culture.

What is completely clear is that culture is not an isolated entity, but a human construction. When talking about culture, it is crucial to remark that the topic deals not with fixed and material constructs, but with acculturated individuals. Culture will no longer be the subject itself, but an object constructed and recreated by individuals. That is why every cultural system organizes, consciously or unconsciously, its existence around its codifying process that underlies its own mental and spiritual structures. So, any acculturation process resides on the continuous cognitive acquisition process by human beings that will generate unappreciable but coherent and extremely strong links among all the individuals influenced by the same cultural schemes.

Apart from the institutional perspective of UNESCO, there are other two main trends that differ substantially when defining culture and cultural activities. The first one of them is the anthropological perspective. This academic discipline proclaims that culture means the totality of the way of life of a given community of individuals [Ariño, 2000]. Culture will, consequently, mean anything created by or derived from human activities, the totality of community life and any human experience, which will be socially transmitted and transformed into peculiarities of every group. This way, culture is the totality of

information that a human being receives in and from his community. That is why, generally speaking, culture is the differentiated way of life of all communities, which will frame every cultural expressions and manifestations. Similarly, anthropology deals with culture in three different dimensions: the ontological one, as constitutive of the human being; the phenomenological one, as historic manifestation of culture; and the hierarchical one, as evaluative of human contribution to the process of fully developing human potentialities [Ariño, 2000]. As can be seen, the anthropological perspective of culture shares with the institutional one of UNESCO the abstract and immeasurable character of the definition.

Sociology, on the other hand, understands culture as an acquired system of signifiers or acquired information by means of social learning. Or in other words, culture is understood as an organized system of symbols and signifiers according to whom human beings are going to interpret their existences and orient their actions. This way, social integration will take place within this system of symbols and relations of signifiers. The meaning of any symbolic form will be the result of complex communication cognitive processes and complex social processes of production, circulation and appropriation. So, according to Williams, culture can be perceived from a double perspective [Jones, 2004]. On the one hand, culture is cultural and artistic activities that imply manifest signifying practices. On the other one, culture is a system of signifiers that constitutes the basis of any social system. Consequently, it can be appreciated that culture is result of the relations and interactions among symbolic forms that model the social system in which they take place. Summarizing, culture can be defined as the result of established relations among different symbolic cultural meanings of any community. Their configuration is extremely important since the group itself will perceive its existence and acts according to these relational structures.

The sociological definition of culture, on the other hand, conceives it as a specific ambit, independent but completely interrelated with the other existing ones on any society. That is to say, reality can be divided into four different ambits completely interrelated although they are independent, namely the economic one, the reproductive one, the political one and the cultural one. The cultural sphere presents a pronounced stratified and hierarchical character that is in direct relation to possession, production or management of symbolic goods [Jones, 2004].

Similarly to what happens with the anthropological approach to culture, from a sociological perspective, four different dimensions can be identified [Ariño, 2000]: the ontological one, related to universalism and the generality of the human beings; the phenomenological one, concerning the emergency of different groups and consequently of diversity; the charismatic one, related to the individual and its creativity; and the socio-historic one, that addresses the structural changes of communities themselves. As can be observed, culture is constitutive, since it is an essential part of the constitutive process as individuals and group. In this level, culture provides communities with pragmatic information of four types:

- Descriptive: how is the world?
- Technical: how should people act?
- Normative: what do people have to do?
- Prospective: provides utopias and visions of what is possible and what not

That is why, every culture provides its group with pragmatic information that will condition and determine individual and group relationships with reality and its environment. Totally related to this fact, culture creates systems of specific norms and values for each communitarian group.

After having delimited culture from these two academic disciplines, this work should be framed under the sociological perspective. In addition to artistic and cultural expressions and manifestations, also other productive processes of cultural goods will be considered culture. So, mainly based on the sociological definition, **culture will be understood as the system of relations between symbols, symbolic forms and manifest signifiers that are result of the cognitive, communication, production, circulation and appropriation processes and from whose interaction will rise the basis of the social system that will orient individual existence and action on the process of construction of their own identities**.

Logically, culture cannot be considered as an isolated body, but as an integral part of the whole complex social relations system. Any change in one of the elements of this dense network will inevitably generate modifications on the others [Castells, 2002]. Consequently, being part of this system of links and relationships, culture is totally related to ambits such

as economy and policies[1]. Quite recently, there has been a flourishing of writings about the relationships of culture and economy. All of them remark the intrinsic and indivisible link between those two spheres in different levels.

First of all, as have been seen on the operative definition of culture, it can be expressed as an ambit of production and reproduction of symbolic values and works. Logically, these production and reproduction processes follow a production chain logic that has to be inscribed into the broader logic of general economic production process [UNESCO, 2009:1-2]. With the irruption of new technologies, however, the cultural production chain has been widely influenced due to the high permeability of the sector and unexpected consequences either for the reproduction as well as for the consumption of digital cultural goods and services. While cultural goods can be defined as tangible or intangible assets with cultural meaning and inherited from the past or produced through ongoing creation processes, cultural services will be considered all activities and performances derived from them [Cheng, 2005:2-3; Cheng, 2002:447-448]. Based on this delimitation, cultural goods are goods produced on the basis of a social and cultural meaning. Their production could have taken place in ancient times, in the nearly past or even can be currently taking place. All the inherited goods, as well as the added new ones, form the stock of cultural goods of each society, which will be made up by buildings, works of art, literature or music, among others. In principle, all the activities related to the mentioned goods are cultural services. Among the most obvious cultural services can be identified attendance to theatre performances, visits to museums or reading books. The current technological and social juncture, moreover, has fostered the digital version of these services, where their physical component has lost its importance and has broaden the possibilities for the consumption of services non-available before. This fact has in some sense impelled the cultural importance of this sector, because cultural services can be considered as consumption services of previously existent cultural goods. Consumption of cultural goods resides on the experience of them. That is, cultural services are the experience of the cultural goods [Lasuén and Aranzadi, 2002]. And so, even if cultural goods have been produced and created to last, consumption of cultural services is based on the ephemeral experience of them. Homer, for example, wrote the *Iliad* for the posterity as an artwork, but its current reading is just the ephemeral and momentary experience of the cultural asset.

[1] The relation of culture with policies will be explained and described on section "2.2.5.- Cultural Policies: challenges in the current Knowledge Society".

On the other hand, completely related to the previous two features, it is crucial to mention that all current cultural economists are really aware of the importance of what has been called the cultural capital. This term is nothing that can be easily measurable, neither definable, since it embraces many complex abstract features. Cultural goods are easily identified and promptly assumed as part of the cultural system of any society or group. When dealing with cultural capital, however, it is not so instantaneously assumed by everybody, because this recent complex term cannot be physically identified, neither clearly delimited on its boundaries. In fact, cultural capital has two main meanings on the scientific realm nowadays. The first one deals with a mere economic point of view, where cultural capital is just the representation of beneficial values of culture for individuals and groups from an economic point of view [Throsby, 2003:44]. This capital, even if it is harder to be defined than other ones, can be compared and matched with, for example, financial capital. Cultural goods and services are mere products or items that can be stocked or integrated and circulated on flow networks. This kind of cultural capital has, consequently, a finite economic cycle [Throsby, 2003:161].

Conversely, sociology has defined cultural capital on a quite different way. Cultural capital will not merely be the amount and stock of cultural goods and services, but also the direct and indirect beneficial values derived from them [Bucci and Segre, 2009; Cheng, 2005; Pethig and Cheng, 2002; Braman, 1996]. This definition assumes that ideas, beliefs and other non-tangible assets are also important part of the cultural capital, because they create a sense of belonging together and binds the individuals of the group [Bucci and Segre, 2009; Braman, 1996]. In this sense, there is a clear difference between the economist cultural capital definition, which can be also translated into measurable cultural goods and services stock and flow, and the sociologist one, which also comprises a non-objectively measurable abstract aspect of communitarian benefits. Sociologist cultural capital is intrinsically related to the production and consumption of cultural goods and services [Cheng, 2005; Cheng, 2002]. The more cultural goods and services consumed, the greater the cultural capital will be. Moreover, the increase of cultural capital may result on benefits not only at an individual level, but also at a communitarian one. Anyway, the beneficial impact of the cultural capital may not be perceived by the consumers if their number is sensitively high [Cheng, 2005:3-4]. A really low number of consumers, however, can create elitist impacts and that is a crucial point to be avoided by policy planning. Members of a group are aware of the benefits of a continuous cultural consumption and that is why

continuous cultural production is impelled even by individuals. Increase of collective cultural capital amount drives to what on previous times was defined as a higher state of civilization [Cheng, 2002:464], because it implies a higher degree of educational level, as well as of creativity on the individuals [Bucci and Segre, 2009:4]. And creativity, as will be explained subsequently, is one of the current engines of development on the Knowledge Society.

As mentioned above, the relationship between culture and economy is quite close. Anyway, there is a clearly related difficult concept to be defined. Similarly to what happened when dealing with cultural capital, it is common to talk about culture in terms of value, but what is not clear is the meaning of this term in each case. For arts people, value is something inherent to culture. There is no need to prove that something is valuable and contributes to human welfare, since these two characteristics are unavoidable for cultural goods [Frey, 2005:3]. When analysing the point of view of cultural economists, however, the relation becomes less obvious and has to be proven [Frey, 2005; Throsby, 2003]. If for the first group cultural value has to deal with abstract ideas and concerns, such as beliefs, ideas and moral principles [Throsby, 2003:19], for economists value is related to economy and market features, such as income, utility, price or positive market performances [Frey, 2005:3]. Logically, the character of the meaning of value related to each group differs substantially. On the one hand, arts people claim for abstract, non-objective and non-measurable perspectives of value [Throsby, 2003:28-29]; cultural economists, on the other, defend a well-defined, objective and easily measurable perspective. Anyway, in both cases value represents a feature of positive characteristics, which will help society and individuals to reach a higher place in the developmental process. According to Throsby's analysis, there is quite a wide range of dimensions to identify cultural value from the more abstract and culture-related perspective [2003:28-29].

- *Aesthetic value*. Individuals and societies value cultural assets and artworks by notions and properties of harmony, canons of beauty and proportion, among others. According to all these socially constructed rules, each cultural good can be valuated and put into its place on the chain of aesthetic values.
- *Spiritual value*. The spiritual aspect of value should not be considered merely in terms of religion, but from a broader perspective. The spiritual value of any cultural asset deals with the capacity of linking individuals with non-physical qualities that

are inherent to every human being. That is, the power of bringing individuals and societies to a more metaphysical sphere of abstraction.

- *Social value*. This facet of value is clearly related to the construction of identitarian and community meanings. It deals with the quality of the cultural good to connect individuals among them and to the broader process of creating a sense of collective.
- *Historical value*. Every cultural asset is intrinsically connected to a certain society in a given historic time and conditions. The reflection, not compulsorily obvious, of their characteristics is what can be considered as historical value.
- *Symbolic value*. It is clear that each piece of culture comprehends its own symbolic meaning. The materialization of this meaning is result of a communitarian process of symbolizing ideas and the extraction and appropriation of the meaning by further individuals and groups will be one of the aims of the existence of the cultural good itself. That is why cultural assets have a symbolic value as embracing and conveying meanings.
- *Authenticity value*. Finally, this is the less abstract of the value dimensions, since the authenticity, integrity and originality of the work can be easily measured. In fact, this dimension is also the less subjective one, because the authenticity of a cultural good is not a socially constructed concept, but a global one.

Generally, culture and arts people will take some or all these perspective and will assess the value of any cultural asset according to them. Cultural economists, however, go a step further and delimit what can be defined as the proper *economic value*. This economic value will be in part the reflection and translation to the market sphere of the previously explained dimensions. The global valuation of these characteristics is the process of determining a measurable economic value of the content. In other words, depending on the abstract valuation of the cultural good, the market logic will determine a measurable economic value for it, represented by benefits, costs, incomes, willingness of individuals and societies to pay for it or derived and related economic benefits and costs, among others. Thus, economic value is the quantification of the cultural asset according to the economic and market logic processes. In this case, besides, the value is not only related to the content or good itself, since it can collaterally originate effects on other economic ambits, such as tourism or jobs arising from the existence and maintenance of the cultural good [Royseng, 2008:5].

These two spheres of valuation of cultural contents and goods are not isolated, but completely interrelated [Throsby, 2003:44]. Even though theorists from each side will claim their notion as the guiding one, the real value of the goods resides precisely on both spheres of action. The Parthenon of the Acropolis of the city of Athens, for instance, can be a clear example to illustrate this fact. The remains of the Parthenon present a clear aesthetic value because of their proportions, their harmony and the great work done on their reliefs and architectural elements. On the other hand, it also represents an attempt to link the material world of human beings with the metaphysical one of the greater powers. At the very beginning, it generated a certain sense of belonging to the same city or community to the citizens of Athens, which currently has been expanded to the whole citizenship of Greece. The building represents the ancient idea of order and society and its current state is the result of the historical events that it has suffered, such as the explosion of the Turkish powder keg on it or the looting of the marbles of the building by Lord Elgin. The Parthenon is also considered as one of the main symbols and achievements of the Hellenism and the glory of the ancient inhabitants of the city of Athens. All these elements give the Parthenon a clearly high cultural value.

This abstract measurement of value is transferred into the material expression as economic value. The beauty, symbolism and reflection of past events of the Parthenon have become it one of the most recognizable cultural assets all over the world. It is used as a touristic attraction for people to go to Greece and Athens to visit it. People, moreover, are willing to pay a certain amount of money to get close to it and be able to admire it closely, even though the building itself can be freely seen from a distance below. These facts are creating a positive cash flow for the city and the country due to the mere fact of maintaining the temple standing. This is a clear material reflection of the high cultural value of the asset. But economic value does not end here, since, besides the touristic economic benefits, its maintenance, conservation and restoration have created jobs that are also positively affecting the economy. Consequently, the real value of the Parthenon cannot be considered only in terms of strictly cultural values, neither of economic ones, but as a sum of both perspectives. This global dimension of value is what has to be taken into account when dealing with cultural capital and the importance of culture in economy and society as a whole [Throsby, 2003:44]. More specifically, cultural capital consists greatly of the combination of the cultural values and their translation into economic terms by individuals.

Nevertheless, one of the main issues still to be answered is the nature of the relationship among culture, economy and development, and more specifically the economic role of culture in the current technological juncture of the Knowledge Society. Traditionally, it has been assumed that culture was the result of economic, social and political development [Bucci and Segre, 2009:1].

The achievement of a certain degree of development would have in this line of thought an equivalent degree of cultural development. Current authors, mainly the ones dealing with cultural capital (Bucci and Segre, Throsby, Lasuén and Aranzadi, and others), however, proclaim that this relationship is not the correct one. For these authors, cultural development is one more part of the whole economic process and not a result of it. As have been seen when talking about the economic value of culture, cultural goods and services generate and foster economic effects for the society and, consequently, can be considered as impellers of the economic development. Even though authors as Bucci and Segre [2009:1] argue that nowadays economic development should be considered the result of cultural processes, it would be fairer to state that the relationship is bidirectional, since it is also true that certain level of development on the economic, political and social spheres contribute to a stronger, more continued and sustainable cultural development.

> The role of culture at the heart of economic development has been profoundly analysed both from the mere economic, as well as from a more artistic and cultural perspective. The adopted operative definition of culture identifies it as an ambit of production and reproduction of symbolic values and works. Cultural goods and services, additionally, can be valued and analysed according to different kind of values. In other words, cultural and economic value should be measured in order to identify the real global value of the cultural assets. Furthermore, taken as a whole, culture is clearly identified as a driver of economic and social development.

2.1.1.- Culture and Economy in the Knowledge Society

As seen on the previous section, culture has not only abstract subjective value, but also measurable economic one. This section, consequently, deals with this latter approach to the valuation of cultural goods and services on the current socio-technological juncture. In fact, as the section remarks, there are some evident differences between productive processes of traditional actual goods and the current digital goods producing ones. These differences derive greatly from the creativity and innovation ideas, which have given place to the economic approach of the Cultural and Creative Industries.

Anyway, on the current social and economic juncture, it is necessary to bear always in mind that technologies are completely reshaping all these kind of relations, because the way of producing, reproducing and consuming has radically changed its basis. The idea of a close link between technological and economic development has been around on the academic milieu for quite a long time [Fagerberg and Srholec, 2008:2; Czernich et al., 2009:3-4]. Since the irruption of the structures of principally the Information Society, technologies have been acquiring a greater importance and transforming everyday practices in all the spheres of life [Healy, 2002:479; Hilbert, 2001:11].

The Information and Communication Technologies put the basis for some profound transformations in human activities and this process of change has been conceptualized by many as the transition from an industrial economy to another one based on the technological profit for the creation of networks of flows to share and distribute mainly digital goods and services [Torrent Sellens, 2009:4; Hilbert, 2001:11]. The change is obvious, but the way of measuring the real impact of this technological developments in the whole economic system is difficult to determine for many economic theorists [Fagerberg and Srholec, 2008:3; Hilbert, 2001:12].

Most of the authors agree that the influence of technological development on the economic processes is really deep and is changing the system as a whole. That is why some authors, such as Hilbert [2001], have denominated this new economic stage as the era of the digital economics. Goods and services have left their physical character and have become mainly digital. Even if in previous periods everything was produced, delivered and consumed on its material form, currently there are plenty goods and services that have acquired a digital form, based on 0 and 1, which can be distributed with people never seeing the actual physical good. In fact, the Internet technologies have become one of the most important actors of daily life, since their implementation has created a simulation of the real material world on the so-called cyberspace [Hilbert, 2001:19]. But, as explained when talking about the Knowledge Society, the main difference resides not merely on the construction of this virtual sphere, but on the use that individuals, companies and even institutions are making of it.

Production and distribution companies, aware of the importance of this new phenomenon, are taking advantage of the huge reach of the virtual infrastructures created by technologies to spread their products and services throughout the whole network with not excessively high costs [Healy, 2002:478]. Moreover, digital goods can immediately reach places that could hardly be reached on their material form. The goods and services flow constantly through the virtual network created by the technological implementation, expanding considerably the time and space dynamics of the markets [Torrent Sellens, 2009:4]. Besides, the network does not limit its use only to enterprises or financial institutions, but is open to the participation of anyone able to get connected to it. That is why it has to be also considered as a big platform of individual or collective communication and exchange of information and knowledge [Hilbert, 2001:20]. Thus, technologies, and mainly Internet technologies, are not just applications for the distribution of contents, but a tool to the service of the process of connecting people, collectives and whatever nodes among them with no greater inconveniences. All these transformations have been compared even to the ones happening during the second Industrial Revolution at the end of the 18th century [Hilbert, 2001:11]. Obviously, all the changes must have reflection on the economic processes and, consequently, nowadays the cultural production and distribution economic system presents some specific features that were not expected some time ago.

Adopting themselves to this new socio-technological juncture, cultural goods and services have experienced a really profound transformation on their roots [Freeman, 2009:3]. The most evident change is that most of the goods and services have left aside their merely physical form and turned also into digital goods and services. This fact, obviously, does not mean that the physical production of goods has disappeared, but it has been combined with their virtual production. In fact, most of the times, the material medium will not determine the essential nature and quality of the good or service, but the perceived and experienced ones, such as on live performances or broadcastings [Freeman, 2009:6; KEA, 2006:48]. Once the digital version of the current goods is created, the costs of reproduction decrease significantly, reaching values near to zero [Garnham, 2005:19; Hilbert, 2001:33]. Any digital content is nothing more than a simple combination of 0 and 1 that presents no complication for the reproduction until the infinite without any loss of quality on the process. Moreover, this is not the only decrease on the costs of the production and distribution process of the electronic contents, since, taking advantage of the established networks of flow and communication, digital goods can be easily distributed by means of

them with no additional cost than the one of getting connected into the virtual sphere [Healy, 2002:478]. This decrease of costs is being crucial for the reshaping of the cultural sector on the current Knowledge Society.

This new way of producing and distributing, however, does not simply imply an electronic transposition of the asset [Sassen, 2002], because it also comprises the possibility of incorporating value adding features to the current content [Hilbert, 2001:33]. This feature represents a great difference at the time of producing contents, since adding value to the digital assets and services means a step further in the process of personalizing and customizing them to the individual needs of the users. In fact, contents can be tailored to the needs and expectations of the specific users. For example, extra features, different languages and multimedia contents can be included to be distributed on various niche markets or even complement or readjust in further times the original ones.

On the other hand, the virtual production and easy distribution of cultural products through the digital networks impels an optimal response to the theory of the *long tail* [KEA, 2006:35]. Cultural market is basically hit-driven and most of the consumption concentrates on some concrete items. Some more specific preferences, nevertheless, are not represented by those popular assets and, consequently, their presence on the cultural market is at least non-significant, if not marginal. All the individuals not represented by the hit goods have more personal tastes and represent a long tail on the cultural consumption figure that is not covered by the traditional cultural producers. The creation of cultural production and distribution networks allows these cultural goods and services bypass the current market mainstreams and reach easily their audiences [KEA, 2006:141].

Table 1
Main differences between traditional actual cultural contents and digital cultural contents.

Actual cultural goods	**Digital cultural goods**
Traditional market logic	Network logic
Based on traditional producers and distributors	Easily accessible for non-majority producers and distributors
Reproduction costs depend on the content	Digital reproduction costs close to zero
Distribution speed depends on infrastructures	Digital distribution immediate
Distribution costs depend on the infrastructures and means of distribution	Digital distribution costs close to zero
Hit-driven consumption	Long tail
Closed package content	Possibility of adding value to the content

Source: own elaboration.

Anyhow, two are the main different roots of the cultural sector on the Knowledge Society. On the first place, cultural production is based on knowledge [Fundación de la Innovación Bankinter, 2007a:24]. Conversely to previous periods of production, material resources have been replaced in a high degree by intangible assets because they have become the basis of current cultural economic activity. It supposes a transformation from the traditional industrial economy into a new model, predominated by a great importance of the flows of information and knowledge through networks [Torrent Sellens, 2009:4]. These intangible assets have acquired the central role on all the productive and distributive processes.

Knowledge must be first differentiated from information, since the latter expresses raw facts and data [Mansell, 2001:62], while the former one is its useful processing and application to the predominant mental and social schemes [Hilbert, 2001:14; Torrent Sellens, 2009:9]. Knowledge is, consequently, information with an added meaning that adapts it to the value and meaning structure of every individual and community. This is one of the reasons not to treat knowledge as a typical productive input, but as a continuous producing process [Hilbert, 2001:13] that evolves through the whole production and distribution system. Moreover, there is another big difference at the time of producing and reproducing these two assets, since, once acquired, information can be easily duplicated and replicated on the digital form, whilst knowledge is not so easily duplicated [Mansell, 2001:57].

Information, that is plain data, requires nothing else than a mere electronic duplication to be available for further distribution. Knowledge, on the other hand, needs a more profound replication process, since it is not a perceivable asset and requires a deep understanding of the guiding mental schemes in which it is going to be inserted. Moreover, the multiplication of information due to the possibilities presented by the technologies makes it more complicated for individuals to choose the proper contents to be transformed into knowledge. Consequently, contrary to what happens with information, the costs of knowledge increase and its production and management becomes task of highly skilled agents [Mansell, 2001:57]. So, **knowledge and knowledge workers have become really appreciated assets on the current cultural production system**. The knowledge worker has to be able to operate on the whole cultural production system [Hilbert, 2001:18-19; CEPAL, 2001:14; Mansell, 2001:60] and not be merely apt for one of the stages of the production chain. This kind of worker, logically, has to be able to adapt himself to any developing situation and, obviously, to learn continuously to be more effective in the rapidly changing system of knowledge production.

Needless to say, the introduction of technologies in the whole production and distribution process has completely transformed the delivery and access of information and knowledge [KEA, 2009a:5]. Being digital, information and data can be easily circulated through the digital networks. In fact, technological revolution has expanded spatial and temporal boundaries for this circulation, adjusting the scale globally and making the delivered content available instantaneously [Torrent Sellens, 2009:4]. Moreover, the irruption of technologies has broken down the traditional top-down communication process, in which specialists where providing users with contents, and completed it by a more horizontal one, in which collaboration among users is also possible [Arnoldus, 2009:14; CEPAL, 2001:3]. This double directionality of the information implies the permeability of information and individuals. People make information available for other people and its accessibility broadens unimaginably. The access to this information, however, is conditioned by the capability of the individuals to get connected to the networks, because taking part in this new model of communication means more than simply accessing the information [Mansell, 2001:64; KEA 2009b:43]. It requires a process of accumulation of skills to be able to improve the performance into these networks and to choose the proper distribution system of the desired contents [Arnoldus, 2009:10]. There is, besides, another difference of the information distribution and production process compared to the traditional ones.

Information, conversely to what happens with material resources, has a higher value once it is spread among many individuals. The more broadly accessible the information is, the more valuable it becomes. Information and knowledge get more value if they are shared and accessed by more people. Anyhow, this generates a problem of authority, since traditional principles of top-down authority and authenticity are changed. Traditionally credit, authenticity and veracity were given by authorities of the field [Mansell, 2001:68]. Nevertheless, currently, on the horizontal communication model, authority cannot be assessed by specialists, but by the majority of individuals. Consumers of electronic information give authenticity to contents presented by well-established authors or to those where more people react positively. That is, the social mass has replaced in some degree the stand alone authority at the time of verifying the electronic contents on the cyberspace. Anyway, taking advantage of the potential of the technologies, many cultural institutions and operators are remarking their authority also in the digital sphere. That is, institutions and operators, not only from the cultural ambit, are trying to reproduce their authority role on the cyberspace through the use of technologies and their applications.

On the other hand, the second different root of the cultural production and distribution system in the Knowledge Society can be identified as the use of creativity and innovation as the driving forces of the whole process. Thus, creativity and innovation have become the central issue for many authors and organisations [KEA, 2009a; KEA, 2009b; KEA, 2011; Yusuf, 2007; Freeman, 2009; Fundación de la Innovación Bankinter, 2007a; Florida and Tinagli, 2004; Hautamäki, 2010; among others]. Even though in many economist spheres creativity and innovation are considered as synonyms, they actually do not mean the same [Freeman, 2009:1]. In fact, in most circles, creativity is an essential requisite for innovation [Throsby, 2003:94; KEA, 2009b:34], but not inversely. **Creativity means a process of imagining and developing an idea of something new or original, being it partially or totally** [Villalba, 2008:12; KEA, 2009b:3]. It means, consequently, that there is an obvious contradiction with what socially is considered intelligence, since the latter requires a linear way of thinking. Creativity, on the other hand, means unpredictability that contrasts with any algorithmic convergent thinking process [KEA, 2009b:23]. Anyway, the simple feature of novelty does not make an idea creative, since it has to be inscribed within the limits of human and social value structures [KEA, 2009b:23]. Traditionally, creativity has been linked to the individual inspiration or the creative genius [Throsby, 2003:95; Villalba, 2008:11; KEA, 2009b:22]. Creativity, so, was an individual process of reflection, inspiration

and development of a new idea or value. Currently, however, due to the social context in which creativity takes place, it is considered a more social and collective process, independent from the previous genial inspiration [Throsby, 2003:95; Bucci and Segre, 2009:3; Villalba, 2008:11]. Creativity inscribes itself on social structures and they can work either as an impulse or as a constraint for this creative social process [KEA, 2009b:22]. Moreover, creativity, as it requires the generation of new or original ideas, implies the challenging of pre-established structures and systems. Anyway, creativity can bring outcomes in three ways: accepting established paradigms, rejecting them or trying to merge the creative outcomes with the current systems [Villalba, 2008:12].

Innovation, on the other hand, requires going a step further, since, if creativity is the original development of new ideas, innovation means transforming creative thoughts into useful practical products or services [Villalba, 2008:23; Fundación de la Innovación Bankinter, 2007a:24; Fagerberg and Srholec, 2008:21; Yusuf, 2007:3; Kaasa and Vadi, 2008:5]. Creativity can be result of a spontaneous or casual phenomenon, while innovation requires a more systematic effort to create a useful and competitive product for the market. Moreover, creativity is result of human talent, whilst innovation needs compulsory financing to translate that talent into pragmatic useful outcomes [Yusuf, 2007:10]. Innovation adds useful value to the abstract intangible creative outcome [Fundación de la Innovación Bankinter, 2007a:6]. Conversely to what it may seem, innovation does not simply circumscribe to the development or production of new or original products, because innovative processes can also be applied to the productive systems [Fagerberg and Srholec, 2008:22]. Innovation is not merely synonym of placing a new competitive product on the market, but also as a process of adaptation of the productive systems with improvements to become the production more competitive in a highly challenging surrounding. So, the production of new devices and products is considered innovation, as well as the development of new producing processes or different ways of distribution of the products. Anyhow, innovation, being it in product creation or in the production system, will work better the less obvious it is [Healy, 2002:481; Fundación de la Innovación Bankinter, 2007a:12-13]. And the more obvious the innovation, the higher the risk of failure of the innovative process [Fundación de la Innovación Bankinter, 2007a:24]. Having seen all this, most of the authors cited above agree that creativity is more abstract and culture-oriented, whereas innovation is more pragmatic and production-oriented.

Creativity and innovation, however, share the characteristics and feature they both stem from. Even though everybody is theoretically able to be creative and innovative [Florida and Tinagli, 2004:11], there are some prerequisites that better foster their appearance, which can be described through cultural capital [KEA, 2009b:3]. On the first place, there have to be some social factors that foster creativity and innovation [Fagerberg and Srholec, 2008:8; KEA, 2009a:4; KEA, 2009b:3; Fundación de la Innovación Bankinter, 2007a:24; Yusuf, 2007:13; Villalba, 2008:13; Kaasa and Vadi, 2008:5-6]. The education and learning received will be vital at the time of propelling creativity and innovation, since individuals exposed to a more innovative and creative education will present a higher degree of being able to develop them in later life. Actually, exposure to arts and culture enhance creativity, as well as participation on these activities stimulates innovative ways of thinking and expressing [KEA, 2009a:5]. Similarly, personal abilities are very important, because individual characteristics are key to determine the innovation and creativity [Bucci and Segre, 2009:4; KEA, 2009b:3; Villalba, 2008:13]. In fact, people with a higher acceptance of risk and willingness to undertake new tasks present a higher innovative degree [Fundación de la Innovación Bankinter, 2007a:25; Yusuf, 2007:12]. Individuals have to present an acceptance of rules and structures, but expressing also certain degree of reversion [KEA, 2009b:25, 39]. Also, some authors [KEA, 2009b:3, 25; Yusuf, 2007:13; Villalba, 2008:13] argue that, on the current social juncture, creative and innovative individuals have to have some technical skills to be able to better perform on the technological surrounding. Besides, currently, innovation and creativity take place widely on highly technological agglomeration places [Bucci and Segre, 2009:3; KEA, 2009a:3; KEA, 2009b:5; Yusuf, 2007:9; Villalba, 2008:13]. The environment, obviously, is the last influencing factor, because multicultural, open and diverse societies favour innovation and creativity due to the confluence of ideas and influences they create [KEA, 2009a:4; KEA, 2009b:10; Kaasa and Vadi, 2008:5-6; Florida and Tinagli, 2004:12]. In fact, these environments are also denominated innovation ecosystems [Hautamäki, 2010:6, 8]. The junction of all these factors are expressed on ideas, metaphors and messages that help to better interact with the rapidly developing society thanks to the creative and innovative vision of the individuals [KEA, 2009b:39]. As can be seen, the current vision of creative and innovation are far away from the former individual genius theory and grounds the vision of a continuous social developing process.

Obviously, all these transformations of the productive system have some reflection on it. In fact, creativity and innovation are supposed to improve endogenous processes of production and distribution [Bucci and Segre, 2009:3; KEA, 2009b:27-28]. That is, apart from being applied to the creation of products, innovative and creative processes have reshaped the whole production and distribution system, readapting it to the new technological and social juncture for a better and more competitive performance. That is why these new phenomena are strongly being taken into account among industrial agents and policy decision makers [KEA, 2009b:6; Kainulainen, 2010:26]. Nevertheless, once again differences between both phenomena have to be remarked also on their implementation, because whilst innovation moves towards financial benefit, competitiveness and sustainable development, creativity aims at more social and human development objectives, such as emotional experience, empathy and positive influence on human behaviour [KEA, 2009b:37-38; Fundación de la Innovación Bankinter, 2007a:8]. Policy makers have to be aware of this difference because the outcomes will differ significantly.

2.1.2.- Cultural and Creative Industries in the Knowledge Society

Resulting from these recent developments, the whole production system has been transformed and, as a magnificent example of it, the irruption of the so-called Cultural and Creative Industries has taken place on the economic field. In the current economic and social situation, the irruption of a new industrial category has become a fact. This new category of classification is no other than the Cultural and Creative Industries (CCI), which is even contested by many economists for not adjusting to the traditional structure of industrial classifications [Freeman, 2009:7]. This reaction is not based on the inexistence of these industries, but on the impossibility of organizing and grouping them according to classical canons. Traditionally, classifications have been done according to the activity of the industry [Carr, 2009:1], but the cultural and creative industries cannot be grouped in such a way, due to the great indefinition that exists among the classification parameters. In many cases, there has been an obvious confusion between the terms creativity and culture, even though, as have been seen before, they actually express quite different meanings [Freeman, 2009:1; KEA, 2006:44; Galloway and Dunlop, 2006:33]. This confusion and indefinition has been present when talking about CCI since the very beginnings [Galloway and Dunlop, 2007:17; Roodhouse, 2006:13], because, although the very first time creative industries reached political ascendance officially was on the Creative Industries Task Force

Mapping Document of the British Government on 1998 [Cunningham, 2002:1; Galloway and Dunlop, 2007:18; Flew, 2002:3], it has evolved and currently diverse countries have adopted different perspectives. In fact, in France they use the term industries culturelles, in the United Kingdom creative industries, in Canada arts and culture industries, in Austria and Switzerland Kulturwirtschaft and in Germany Kultur- und Kreativwirtschaft, among others [Söndermann et al., 2009a:1]. All these terms identify the same conglomerate of industries, but referring to them on different ways. It is, however, important to adopt a unified term that includes all these perspectives [Söndermann et al., 2009b:3] and, thus, the term Cultural and Creative Industries will be further used to refer to their globality[2].

Being it so, the Cultural and Creative Industries are considered by experts as current drivers of creativity and economic growth [KEA, 2006:30; KEA, 2009a:6; Carr, 2009:15; Freeman, 2009:7; Hesmondhalgh, 2007:6; Cultural Ministers Council, 2008:3; Fesel and Söndermann, 2007:7; Kainulainen, 2010:26]. Moreover, Cultural and Creative Industries are also identified as a leading component of innovation and social cohesion [Carr, 2009:15]. With this logic, this new group of industries has moved to the centre of the economy, leaving aside previous prejudices of not being real, durable and useful products [Hesmondhalgh, 2007:1]. That is to say, moving away from materialistic perspectives, cultural products, as well as creative processes are currently considered as an integral part of the whole economic system. CCI work among three different spheres of action, namely publicly funded culture, commercial culture and social production [Carr, 2009:6; Roodhouse, 2006:17]. This place of combined action represents a challenge for these industries, because the equilibrium among the three spheres is difficult to maintain. Anyhow, it is really important to remark that there are diverse activities and businesses not circumscribed to standard industrial codes, but that share the importance of contents and symbolic values, such as heritage [Carr, 2009:3]. It is also crucial to bear in mind that there are also creative activities that take place outside the production and distribution circuits of the creative industries [Carr, 2009:14]. That is to say, it is important to differentiate between creative industries and creative activities on non-creative industries or ambits. Leaving these aspects aside, with the term Cultural and Creative Industries some authors define them as creation, production and distribution of goods and services of cultural and creative character [Söndermann et al., 2009a:22], most of which take place on the third sector, outside traditional cultural circuits [Böse, Busch and Dragicevic Sesic, 2006:131]. Currently,

[2] Anyway, when referring to separate parts of them, the terms cultural industries and creative industries will be the used ones.

mechanical reproduction, mechanical recording and mechanical transmission of goods and services are at the core of productive processes of the CCI [Freeman, 2209:6]. Anyway, the first and most important step of creating the goods and services cannot be mechanized, since creativity is a merely human quality [Freeman, 2009:10]. In other words, cultural and mostly creative industries tend to a progressive mechanization of the processes of production and distribution, but the creation process will remain human, because no machine can replace human creativity.

In line with the given reasoning, two main dimensions on the Cultural and Creative Industries are considered. On the first place, purely cultural industries have been defined as the most directly ones involved on the production of social meanings, through signifying and signifiers [Hesmondhalgh, 2007:11-12; KEA, 2006:35]. Anyway, some forms of industry, such as theatre and strictly speaking arts, have also been identified as peripheral to the cultural ones [Hesmondhalgh, 2007:13]. That is why some authors defend that the term cultural industries has been coined by nation states to insert into previous structures of the arts the large and commercially profitable industries of TV, music and film [Cunningham, 2002:5]. All these cultural industries have experienced a great development during recent times, due to the industrialization and commodification process of culture [Hesmondhalgh, 2007:56-57; KEA, 2006:31]. Whilst industrialization means that culture has become part of the whole industrial fabric, the commodification expresses that culture is reflected on products for the use and exchange to enter circuits of production and consumption. However, this commodification of cultural goods and services is an ambivalent and risky process, because it can lead to excessive privatization of the cultural experience [Hesmondhalgh, 2007:186]. On the other hand, conversely to the cultural ones, creative industries are less nation state-defined and more globally dispersed [Cunningham, 2002:7]. **The difference is important, since cultural industries are more oriented to nationally related objectives of social values creation, whereas creative industries are perceived primarily as the commercial dimension of the cultural sector** [UNESCO, 2009:5, 13; National Museum Directors' Conference, 2004b:28]. Creative industries, besides, make use of the contents generated by cultural industries for mass reproduction and consumption, which, unlike the contents of cultural industries themselves, are not consumed on the spot [KEA, 2006:35]. So, cultural industries generally create contents that the creative industries exploit for the mass consumption of people.

Both cultural and creative industries share many common features and characteristics that make them differentiable from the rest of the industrial system. There are five main criteria to define Cultural and Creative Industries, namely the use of creativity on the production processes, the predominance of intellectual property rights, the symbolic meaning of goods and services, their use value and the distinctive production methods [Galloway and Dunlop, 2006:35; Galloway and Dunlop, 2007:19-25]. On the current sociotechnological juncture, the handicraft models of work are getting out of date on the present innovative production systems [Freeman, 2009:6]. It does not mean that human or handicraft works are disappearing, but that some of the processes of production and distribution are being mechanized looking for more competitive and innovative processes. Technologies, obviously, have had a great importance on this development of the industrial processes, by meaning a positive impact for the creative industries at the same time that they challenged the whole industrial systems [Söndermann et al., 2009a:1; KEA, 2006:35-36]. Apart from facilitating and mechanizing production and distribution processes, technologies have also permitted CCI to adopt new models of communication and relation with the customer [Cunningham, 2002:6]. Currently, relation and communication processes are more direct and rapid than ever before and Cultural and Creative Industries, as well as many other industries, are taking advantage of it. As regards the content with which they work, culture has, logically, entered the market logic and creative industries are trying to obtain clear profit from its production, most of the times independently from purely cultural development processes [Janovic and Mocnik, 2006:223]. That is, due to the commodification process of culture, mostly creative industries are treating it as a mere product for the exchange and consumption with no regard to the social and cultural development itself. Anyhow, it is obvious that they develop products and services that affect the vision of the reality of societies [Hesmondhalgh, 2007:3] and that they have had a rapid development of cultural goods and services [Söndermann et al., 2009a:1]. This kind of industries deal with high-added value inputs and produce knowledge-based goods and services [Cunningham, 2002:7] that clearly influence the social and cultural values of societies and reinforce continuous readapting processes. Moreover, these industries have witnessed, thanks to the positive influence of the use of technologies, a great development on the production and distribution of those products that have helped them to achieve a really relevant position in the whole industrial system. Nevertheless, CCI have to face some challenges, mainly because their products and services are designed for local audiences most of the time, having to compete with international hit-driven ones [KEA, 2006:35].

Moreover, due to their non-dependence of public funds, Cultural and Creative Industries have to struggle on the market logic, adopting a high risk of failure because of the volatility of both the products and the tastes of the audiences [KEA, 2006:35; Flew, 2002:7; Fesel and Söndermann, 2007:25]. Conversely to other kind of industries, the ones dealing with the production of cultural contents are really exposed to unpredictable changes on the market, because the demand will go hand in hand with modes and changing tastes of the consumers. This human component of the consuming ride [Freeman, 2009:10] adds an extra risk to any cultural production and not being part of the traditional institutional public funding circuit leaves CCI unprotected on the market logic.

Taking into account the physical characteristics of these industries, they tend to be small businesses [Carr, 2009:2; Cunningham, 2002:6; Fesel and Söndermann, 2007:19, 24; KEA, 2006:99], with self-employed workers [Carr, 2009:2; KEA, 2006:99], informal hiring and project-based works [Carr, 2009:2]. Logically, this description does not correspond to the huge international companies, but to the average local, regional or national ones. Due to their size and availability of resources, the importance of the creation of networks for these CCI is really high [Carr, 2009:2, 11; Freeman, 2009:7; UNESCO, 2009:13]. In fact, many of these industries create conglomerates[3], in which they make use of each other's resources or even products to be able to survive in the market [Freeman, 2009:7; Flew 2002:25; Fesel and Söndermann, 2007:25]. That is why many times, some authors describe a current converging process among creative industries, media and communication [Cunningham, 2002:7; Hesmondhalgh, 2007:303; Roodhouse, 2006:25], whose basis is the increasing importance of content creation and the role of these industries as inputs for many others. Similarly, companies who invest on creativity or are linked to creative industries are more likely to introduce product innovations, as well as developing more diverse and higher quality products [KEA, 2009:6]. This is the reason for the current expansion and importance of the Cultural and Creative Industries.

If there is a differentiating factor on all these industries, however, it is the character of their workers. Adapting themselves to current technological and creativity demanding environments, CCI cannot proceed with traditional physical based workers and they hire what currently is known as creative workers. These workers are identified as the ones creating most economic value currently [Bille, 2008:4] and their workforce is nothing else

[3] As will be seen after, even in the strict spatial sense.

than creativity [Bille, 2008:4; Carr, 2009:2; Freeman, 2009:10]. Even though most of the production processes of the Cultural and Creative Industries can be mechanized, creative workers are irreplaceable, because the creative force and the creative thinking are merely human features [Freeman, 2009:10]. However, unlike previous times, creative workers should not be considered artists or genius, but symbols creators [Hesmondhalgh, 2007:5]. Creative workers are highly skilled individuals [Carr, 2009:8; Bille, 2008:4; KEA, 2006:99], whose work does not consist of creating artworks by genial inspiration, but of producing goods and services that will be distributed among principally cultural consumers. Creative workers are defined by some contradictions, because they are individualist but also team workers, independent but also networkers, and co-operators but also competitors for the peers [Carr, 2009:11]. Although their formation can be quite specific, all creative workers are encouraged to work on and be able to organize the whole production processes of the creative sector [Carr, 2009:2]. Anyhow, there are some slight differences that permit grouping them into two categories [Bille, 2008:4]:

- The creative core. The most creative ones, who create new forms to improve working practices. Their solutions are pragmatic and usefulness-oriented. This group is made of IT people, architects, researchers, artists, entertainment people or sport, media and advertising people among others.
- The creative professionals. Their creativity is oriented towards problem-solving and being part of this group demands a high level of education and formation. This group consists of high technology industries people, managers, legal professionals and medical professionals among others.

It is really important, likewise, to make a clear-cut definition of what the Cultural and Creative Industries are, since traditional frameworks based on pre-digital era structures are not feasible anymore [UNESCO, 2009:5; National Museum Directors' Conference, 2004b:29]. Conversely to traditional classifications based on the activity, new creative classifications are focused on the occupation [Carr, 2009:1]. The initial differentiation identifies, on the one hand, the cultural sector or the traditional arts and, on the other, the creative sector or the industries that utilize culture as an intermediate consumption [KEA, 2006:44-45]. Even though cultural industries are assimilated to traditional arts, CCI tend to forget heritage as an extremely important economic force [Cunningham, 2002:1]. The difficulty of measuring the economic impact of the heritage sector has been key to not

include it into some of the new structures of industrial classification. In fact, standard CCI industries classifications differentiate between cultural industries, comprising arts and antique market, music industry, book and press, film and video, broadcasting industry and performing arts, and creative industries, which embrace advertising and the software and game industry [Söndermann et al., 2009a:22-23; Cunningham, 2002:1]. As can be seen, even more recent classifications do not reflect the importance of heritage on the industrial system.

Going a step further, UNESCO has created a new industrial Cultural Statistics framework that takes into account the whole cultural cycle that interconnects all the stages of the production, namely creation, production, dissemination, exhibition/reception/transmission and consumption/participation [UNESCO, 2009:11-12].

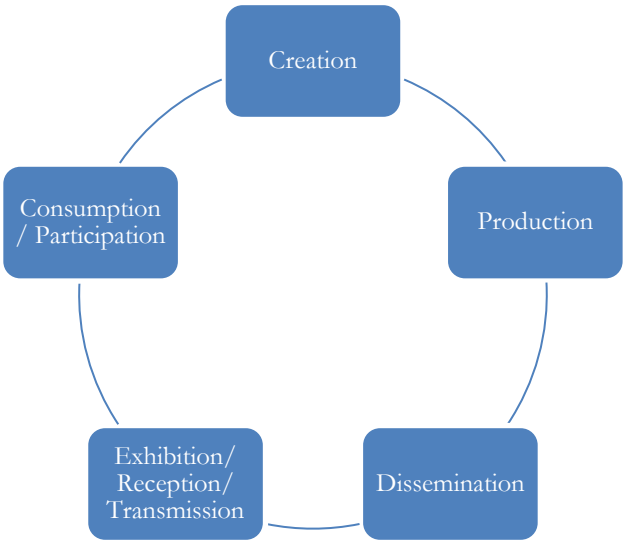


Figure 1: The culture cycle. Source: UNESCO, 2009:12.

This cycle reflects better the whole process of cultural production and allows the introduction of heritage and its importance into the economic and industrial circuits. Taking into account all these circumstances and the needs of the current juncture, another more extensive and detailed classification has been proposed recently [KEA, 2006:53]. This new concentric radial organisation of Cultural and Creative Industries is structured in four main areas:

- Arts field. These core activities have non-industrial character and are identifiable with the most traditional view of arts and culture. This ambit incorporates visual arts, performing arts and heritage.
- Cultural industries. This first circle embraces industrial activities that aim at the massive reproduction of their contents [Fesel and Söndermann, 2007:16]. The exclusively cultural outputs of these industries are based on copyright [Fesel and Söndermann, 2007:24] and that is why sometimes they are also identified as intellectual property industries. This area comprises film and video, television and radio, video games, music and books and press.
- Creative industries. The activities of this second circle incorporate creative activities on their production processes. Although they are not strictly cultural, these creative industries are related to the cultural sector, because they use cultural input for their creative production processes. The creative industries consist of design, architecture and advertising.
- Related industries. This final sector is the most ambiguous one, since it involves industries that are somehow linked to previous circles and facilitate their production and distribution processes. These industries are generally device producers for the distribution and consumption of cultural contents, such as computer manufacturers, MP3 player manufacturers or mobile industries, among others. These related industries are the technology and innovation providers that allow the production and distribution of the original contents.

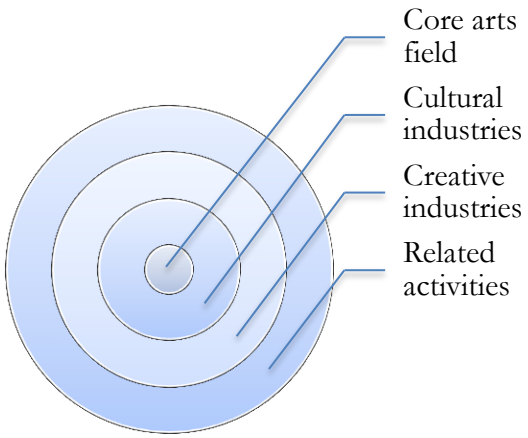


Figure 2: The cultural and creative circles structure. Source: KEA, 2006:56.

Table 2
The Cultural and Creative Industries sector

Circle	**Sector**
Core arts field	Visual arts
	Performing arts
	Heritage
Cultural industries	Film and video
	Television and radio
	Video games
	Music
	Books and press
Creative industries	Design
	Architecture
	Advertising

Source: KEA, 2006:56.

As can be identified, the intensity of cultural contents decreases in the same degree that the industries situate themselves further away from the centre of the concentric model. This framework reflects the whole cultural and creative sector of the current economic panorama. The importance of all these industries and activities in current economies is equally reflected by numerous facts and figures at a national and international level. When analysing the economic impact of the Cultural and Creative Industries, an obvious difficulty is the lack of consensus of the model and indicators of analysis. While some countries, such as Germany, have adopted the framework presented by the report *The economy of culture in Europe* [KEA, 2006], other still maintain traditional schemes. In fact, the Spanish Ministry of Culture works with statistics dealing with purely cultural activities [Ministerio de Cultura, 2006; Ministerio de Cultura, 2008], that makes it non-comparable to more contemporary statistics from other countries.

Anyway, general trends reflect that the weight of cultural and creative activities is currently high in advanced societies and still growing [Florida and Tinagli, 2004:11; Söndermann et al., 2009b:5; Power and Nielsén, 2010:3; KEA, 2006:35, 65; KEA, 2011:24]. This aggregate group of industries employed a total of 6,576,558 persons in 2006 or, what is the same, a 2.71 per cent of the whole European labour market [Power and Nielsén, 2010:3]. This same group of industries, moreover, generated a turnover of more than € 654 billion in 2003, meaning a value added of 2.6 per cent of the total European GDP [KEA, 2006:61; KEA, 2011:25]. Values of individual European countries show the same trend, even though there are some cases in which they show a higher importance of the Cultural and Creative Industries in the overall economy of the country economy. A clear example is Sweden, where CCI have a value added of 9.0 per cent of the total GDP and their

workforce represent a 10.0 per cent of the total labour market. Similarly, Denmark also presents high values in both cases (5.3 per cent and 12.0 per cent respectively) and the United Kingdom is, after Sweden, where the value added in percentage of the GDP is the highest (6.8 per cent of the GDP).

Table 3
Value added and workforce of the CCI in different geographical ambits, in total and relative values.

Geographical ambit (year)	Value added (€ billions)	% of GDP of value added	Workforce (thousands)	% of total workforce
EU30* (2003)	654	2.6	6,576	2.71
Germany # (2006/2008)	61	2.6	1,000	3.3
Denmark† (2000-2001)	8.3	5.3	170	12
The Netherlands (2004)	---	---	240	3.2
United Kingdom‡ (2001)	85	6.8	1,300	4.3
Finland§ (2002-2003)	4.3	3.8	85	3.2
Latvia (2004)	0.3	4	41	4.4
Sweden (2000-2001)	17.1	9	400	10
Lithuania (2002)	0.04	0.2	57	4
Poland (2002)	17.3	5.2	---	---

Source: KEA, 2006:33-34; Söndermann et al., 2009a:5.
Notes: * EU30 means the current 27 Member States of the European Union, Iceland, Norway and Switzerland.
Data referring to value added relate to the 2006; data referring to workforce relate to the 2008.
† Workforce related to full-time employees in the private sector.
‡ Workforce related to the private sector.
§ Data referring to value added relate to the 2002; data referring to workforce relate to the 2003.

Europe is advancing on the process of becoming a leading knowledge-based innovative society. But there is apparently a difference of performance among countries. Indeed, evidences show that Northern European countries perform better than others, with Finland, Sweden, Denmark, the Netherlands and Belgium above the rest [Florida and Tinagli, 2004:40; Fleming, 2007]. They can even compete with the United States the leadership in some competitiveness aspects of these industries. Other countries, such as Italy, Spain, Portugal, Austria and Greece, will have to face difficult challenges to adapt to the new panorama of economic performance of the Cultural and Creative Industries, because they represent the laggard countries of Europe [Florida and Tinagli, 2004:40].

There is an evident tendency of small countries to perform on the first places of the ranking of share of CCI employment, because among the first ten countries, eight of them have a population of less than ten million inhabitants [Power and Nielsén, 2010:13]. There can be different explanations for this phenomenon, being it either that the greater the market the greater the possibilities of exploiting economies of scale for the provision of cultural and creative goods and services, or that small countries own cultures harder to be treated by outsiders [Power and Nielsén, 2010:13]. Anyway, there is a regional clustering trend, with Nordic countries on the top of the list, whilst Eastern and Mediterranean countries appear in lower positions. In order to better perform in the current juncture, these countries will have to reinforce their capability to attract, retain and develop their creative resources.

Table 4
CCI employment amount of the country and share of the total labour market.

Country	**Employment amount**	**% of the CCI employment in relation to the total**
Iceland	8,633	4.01
Netherlands	377,903	3.94
Sweden	205,831	3.76
Denmark	124,352	3.48
Switzerland	167,479	3.40
Finland	96,511	3.25
Ireland	70,602	3.20
Estonia	23,965	3.14
United Kingdom	1,131,697	3.12
Norway	81,874	2.96
Malta	5,765	2.94
Slovenia	29,151	2.87
Austria	131,015	2.83
Germany	956,668	2.79
Spain	655,042	2.74
Hungary	134,921	2.73
Italy	767,521	2.66
Czech Republic	156,272	2.64
Latvia	31,720	2.60
Cyprus	10,794	2.52
France	634,251	2.52
Lithuania	26,102	2.38
Slovakia	61,777	2.30
Greece	128,421	2.28
Belgium	101,464	2.26
Portugal	96,741	2.13
Luxembourg	5,273	2.08
Poland	162,408	1.69
Bulgaria	65,587	1.63
Romania	126,637	1.18
EU30	**6,576,558**	**2.71**

Source: Power and Nielsén, 2010:14.

As seen before, CCI tend to concentrate in some major urban areas. However, the relationship between population and concentration of Cultural and Creative Industries is not direct and linear, since some of the regions with lower population are among the first fifteen ones regarding the employment of the CCI [Power and Nielsén, 2010:6]. This phenomenon can be identified as an extreme overrepresentation of the employment in Cultural and Creative Industries in cities, such as London, Munich, Stockholm or Athens, among others.

Table 5
CCI employment ranking of the regions and cities and their ranking of population.

Region, city or country	**CCI employment ranking**	**Population ranking**
Île de France – Paris (France)	1	1
Inner London (UK)	2	46
Lombardia – Milan (Italy)	3	2
West-Nederland – Amsterdam (Netherlands)	4	4
Comunidad de Madrid – Madrid (Spain)	5	9
Cataluña – Barcelona (Spain)	6	5
Denmark	7	10
Lazio – Roma (Italy)	8	12
Oberbayern – Munich (Germany)	9	22
Stockholm (Sweden)	10	98
Kozep-Magyarorszag – Budapest (Hungary)	11	49
Outer London (UK)	12	18
Berks, Bucks and Oxon – Oxford (UK)	13	82
Attiki – Athens (Greece)	14	28
Oost-Nederland – Nijmegen (Netherlands)	15	36

Source: Power and Nielsén, 2010:6.

If analysing the share of CCI employment in relation to the total amount of the labour market of the regions, however, the panorama changes slightly, because cities like Bratislava, Oslo or Karlsruhe appear among the first fifteen places. As the focus of this indicator is not the total amount of employees in Cultural and Creative Industries, but their weight on the total labour market, small regions show their capability of specializing and becoming more competitive in the creative and cultural realm [Power and Nielsén, 2010:9]. Anyhow, the most common feature is that larger regions and cities have a pre-eminence also in the results of this indicator, as can be seen in the table below.

Table 6
CCI employment amount of the regions and cities and their share of the total labour market.

Region or city	Employment amount	% of the CCI employment in relation to the total
Inner London (UK)	235,327	5.95
Stockholm (Sweden)	86,239	5.87
Prague (Czech Republic)	53,461	5.81
Bratislavsky kraj – Bratislava (Slovakia)	21,776	5.01
Berks, Bucks and Oxon – Oxford (UK)	80,628	4.94
Hamburg (Germany)	54,867	4.75
Kozep-Magyarorszag – Budapest (Hungary)	82,429	4.69
Oslo og Akershus – Oslo (Norway)	39,778	4.61
Oberbayern – Munich (Germany)	97,050	4.32
Karlsruhe (Germany)	55,794	4.30
Madrid (Spain)	172,800	4.30
West-Nederland – Amsterdam (Netherlands)	195,646	4.23
Berlin (Germany)	60,736	4.15
Île de France – Paris (France)	301,895	4.15
Lazio – Roma (Italy)	118,047	4.11

Source: Power and Nielsén, 2010:9.

The current data and trends related to Cultural and Creative Industries show clearly that the importance of the sector in the overall economy is great. The current data, moreover, show that the importance of this sector is not going to decrease in a short term [Power and Nielsén, 2010:13]. Evidently, political decision makers are aware of this fact and are trying to regulate the sector by publishing different cultural policy programmes, plans and initiatives.

Technological applications have facilitated the diffusion and communication of cultural contents with no time or space constraints. Consequently, digital cultural contents have achieved a preeminent place in the economic network cycle. These changes have been fostered by the extensive use of knowledge as a productive resource, as well as for the increasing influence of creativity and innovation on the production and distribution processes. Taking these new features as a basis, recently economic analysis of the impact of cultural goods and services has remarked Cultural and Creative Industries as one of the most important industry clusters in advanced societies. Moreover, there are evidences that support the fact that the importance of the sector is currently growing.

2.2.- Culture and Knowledge Society

Since the irruption of technologies in daily life activities, there has been a development from the so-called Network Society to the Information Society, where individuals can get access to any kind of information simply connecting to the Internet technologies. Lately, however, because of the more social character of the technologies, simple information has become knowledge. The irruption of technologies in daily life activities has completely transformed not only the interaction with this type of applications, but also some profound social structures. Currently, the pervasiveness of these technologies is becoming more evident and the increasing number of mobile devices has facilitated the ubiquity of the related applications, broadening the access to contents to diverse audiences, as well as to different places.

Culture is given a predominant role in European social development [Council of Europe, 1997:15]. This role is related both to the empowerment of individuals, as well as to the economic development of the places. Ranging from the very initial digital leaflet versions of cultural institutions to current immersive three-dimensional environments, the evolution of technologies applied to cultural contents is full of successes and failures. In fact, only the most adapted and robust technologies have achieved a prominent place on the current panorama, leaving all the failing ones aside. Consequently, cultural institutions have been provided with powerful tools to transform the productive processes of their contents and even to better meet the personalized needs and expectations of the users. Moreover, technologies and their rapid development and application in all the realms of social activity are transforming the structures of society as a whole and putting into effect changes hardly expected before. It is hard to even identify trends of development of technologies in the

near future, because the evolution degree is increasing constantly. Current debates focus on how to make technologies more intelligent. The change, however, has not only been technological, but also philosophical. Users have become active content generators and sharers of knowledge, away from the static information consumer of the initial stages of technology.

Due to this trend of constant technological and social transformation, cultural institutions, operators and even institutions have begun to reflect on the relationship among culture, technologies, creativity and economic growth. Moreover, there is a recent trend of estimating the economic value of cultural activities that has been reflected on numerous reports on the economic contribution of the cultural and creative industries to national and international wealth. Even if cultural planning has been a constant during last times, currently it has taken a more specific character, since dealing with innovation and creativity on the cultural sector has been identified as a factor of growth for the economies. So, the awareness of the importance of the cultural policies has also grown exponentially [Obuljen, 2005].

2.2.1.- Background: Towards a Knowledge Society

Many authors describe the current socio-economic juncture as the Knowledge Society [Jeffrey and Nayman (eds.), 2001; Zinnbauer, 2007; Cachia et al., 2007], but the development until the current situation has been diverse and varied. This section, consequently, deals with the gradual implementation of technologies for different uses of daily life and the consequences it has have, not only on the technological use, but also on profound social structures. Beginning from the very initial applications of the Network Society during the 90s, the section describes the main characteristics of the subsequent Information Society and remarks the current implications of technological implementation on the ongoing Knowledge Society.

Since the 1990s the possibilities presented by technological applications began to transform the very framework of societies themselves, because "economies throughout the world have become globally interdependent, introducing a new form of relationship between economy, state, and society, in a system of variable geometry" [Castells, 2002:1]. Even if technological development is a continuum through history of humankind, changes during recent times have comparable results to the ones that took place during the Industrial

Revolution [Hilbert, 2001:11], because the material basis of society has been reshaped to converge with the new arising realities. After the advent of the Internet, societies no longer built their structures upon old conceptions, but upon the basis of a newer one, called the Network Society.

The *Network Society* was the first step into a process of completely globalizing and interconnecting the whole world by means of the possibilities of the recently arisen Internet. Using this new application, the flow of material goods and wealth could be made without any physical or material restriction among connected entities. The creation of the Internet was mainly conceived for military purposes, but during the last decade of the 20th century it turned into a really useful tool for the business sector. Right away, transactions and business operations became immediate with no regards to space or time spans [Castells, 2002]. And this fact became the main factor to change the whole structure of society, because, before the irruption of the Internet on the business sector, the world could be delimited into the North and the South, meaning the developed Western world and the underdeveloped rest of the world. But, from that moment on, the division became clearer not only among these two segments, but also between the connected nodes and the non-connected ones. The actors not able to get into this new developmental trend would be left aside and not consider part of the system. Or in Castells words [2002:2], the fracture would, from that moment on, be "between the dynamic segments and territories of societies everywhere, and those others that risk becoming irrelevant from the perspective of the system's logic". According to this new conception, the capability to insert into the new cycles of communication and flow of goods would be the determinant factor for the relevance of every actor, becoming the whole world, for the first time, into a globally interconnected network of communications and relationships. Another very important result of the global implementation of the Internet was the break of the predominant time and space logic and its replacement by the *space of flows* and *timeless time*[4]. Consequently, the Network Society varied the complete panorama of societies, becoming them more

[4] "On the other hand, the new communication system radically transforms space and time, the fundamental dimensions of human life. Localities become disembodied from their cultural, historical, geographical meaning, and reintegrated into functional networks, or into image collages, inducing a space of flows that substitutes for the space of places. Time is erased in the new communication system when past, present, and future can be programmed to interact with each other in the same message. The *space of flows* and *timeless time* are the material foundations of a new culture that transcends and includes the diversity of historically transmitted systems of representation: the culture of real virtuality where make-believe is belief in the making" [Castells, 2002:406].

permeable for outer influences than they ever were but, at the same time, providing them greater possibilities of gaining a relevant place in the worldwide scenario.

Cultural institutions did not get into this cycle immediately [Peacock, 2008a:346], because, as stated before, the main objectives were not directly related to the cultural realm or the diffusion of contents and information, but more clearly to business and financial operations. Anyway, this stage has been fundamental on the further development of developed societies, because it grounded the basis for the subsequent creation of a networked environment all over the world. At this very moment, the logic of connection nodes and communication flows began to be more than an abstract concept and became reality in many places and institutions.

It is not until mid-1990s that not only financial institutions and enterprises began to make use of the possibilities of technological applications [Fundación de la Innovación Bankinter, 2007a; Castells 2002:51-52]. In fact, from the central years of the last decade of the 20th century on, the Network Society began to be called the *Information Society*, where the main objects flowing on the Net were not only financial and monetary data, but also very different kinds of information. The main factor for this change of perspective when analysing the technological trends of institutions and even citizens can be explained as the opening of new communication channels [Castells, 2002:51]. The Internet, little by little, opened its communication power to other kind of institutions and particulars. It transformed from a mere tools to make business into a more global one that allows communication all over the globe without any constraint, beyond the capacity of transmission of information packages to other terminals. So, it moved from the office to more and more daily life spheres, such as home or entertainment places [Castells, 2002:51-52]. Thus, the late 90s can be considered as the starting point of the global expansion of the Internet, which boosted the globalization of cultural contents.

Even if it is the most obvious one, the case of the Internet is not the only one when talking about spreading of new communication channels. The rise of mobile phones has to be mentioned as another milestone of the technological development path [Fundación de la Innovación Bankinter, 2008; Bloem, van Doorn and Duivestein, 2009:16], because they fostered ubiquitous communication among individuals. Mobile phones became a vital contact and communication tool of everyday life not only in means of oral communication,

but also of the written one. No one could have expected that a simple "Merry Xmas" sent from a computer by Neil Papworth, engineer of Airwide Solution, to the mobile phone of the director of Vodafone, Richard Jarvis, would become such a cultural phenomenon in short-term [Fundación de la Innovación Bankinter, 2008:69]. This brief and simple text message opened the possibility of not only communicating orally, but also through written characters. This event can be considered as the turning point from simple voice services of telephony to data services. Since that moment, use of SMS (Short Message Service) has been developing continuously, becoming nowadays one of the most popular communication channels among individuals. For example, in Spain, as a mean every individual sends fifty messages per month [Fundación de la Innovación Bankinter, 2008:69-70].

These two events changed considerably the path of development of advanced societies. Taking advantage of the pre-existing infrastructures, the new communication channels offered novel possibilities to users and extended widely an original paradigm of communication, where it can be instantaneous and without time or space constraints. Moreover, information and communication technologies left to be tools of merely financial and business institutions to be available for every one that could afford to have one of them [Castells, 2002:51-52]. The continuous decrease of the price of the devices and connections to the communication networks, besides, fostered the process of universalizing the use of these technologies.

From that moment on, financial and business institutions will not have the hegemony of technological applications, since all kind of information would be made available by many different types of institutions. From the stock exchanges to sport associations, multiple institutions began to make use of the possibilities of the Internet-based applications to be present in a broader space. In this new juncture, cultural institutions began to be conscious of the importance of being present into those new communication circles and began to implement technological applications to make their institutions and contents known for all the people [Peacock, 2008a:346]. During these years of development of the Information Society, museums websites multiply and cultural institutions claim for their place into the new digital realm. At this moment, mainly because of the novelty of many technologies, websites tend to be a mere digital replication of the information about the institution. That is to say, museums' websites tend to be a mere digital leaflet with some facts about the

institution, schedules and brief descriptions of the contents. Although with the evolution of technologies and applications these first attempts can seem to be quite simple, for that time they were a huge step forward in the process of consolidating the Information Society, whose philosophical ground was to made information available for all the people.

Summing, as time passed by, the Information Society settled down definitely and its philosophy changed the structures of societies itself as will be explained subsequently. Mid-90s witnessed an exponentially growing number of communications and exchanges of all kind of objects and contents. Users of the new communication channels were able to spread their message all over the globe without too many constraints and, equally, users were able to access to the contents they wished with a single click. Even the tiniest cultural actor was supposed to be beneficiary of this trend of globalizing contents [Castells, 2002:51-52], being them cultural or not. But, as could be expected, during the initial years of the globalization process mainly big actors from powerful regions gain ground on the international arenas. This effect is gathered and reflected in the theory of Castells of the *space of flows* [2002:406], where the traditional conception of space was substituted by a more abstract and non-physical one. Space on the digital new reality cannot be delimited as usual, has no physical boundaries and ubiquity has replaced locality. That is, everyone at any location in the globe is able to access contents from any other person in the antipodes without having to go there. Space on the new digital sphere is a continuum where everything is at hand.

As began during early 90s, the concept of time has also transformed into a new one. There is no conventional time at all or, in other words, the dimension of time has become totally blurred in the digital realm. It does not matter what time or day one does access the content, since "the internet never shuts down, while for instance libraries and archives do" [Arnoldus, 2009:6]. This new concept allows institutions to be virtually open twenty-four hours a day during all year long, even if they are closed, on holidays or even restructuring the physical infrastructure itself.

Lastly, but not less important, the introduction of digital technologies into the cultural sector considerably changed the perception of costs of reproduction. After having being created, any digital content can be perfectly and infinitely reproduced with no more requirements than the activation of a simple electronic copying process [Arnoldus, 2009:6].

These digital reproduction processes, moreover, have very little marginal costs and the digital distribution of the contents can be done with costs close to zero. This fact fostered immediate and unlimited distribution of any kind of digital contents all over the world. The traditional chain of production, obviously, was influenced and transformed by the simplification and reduction of costs of the digital reproduction and distribution and all sectors had to adapt their schemes of procedure to the new reality of functioning. So, cultural sector began to drastically change most of its traditional business conceptions to the new juncture.

The social development that technological evolvement brought did not end up at this stage. In fact, the settlement of the Information Society can be considered as an intermediate step towards the current stage. Witnessing the rapid development of technological applications and their multiplying potentials, during the second half of the 90s many institutions and individuals began to claim for a change of conceptualisation of the use of those applications with no merely economic-oriented, but also socially-oriented objectives [Council of Europe, 1997:31-32]. Information, as such, will be considered as a series of data, a sequence of bits that has to be processed to get some meaning. But with no comprehension of what really these data mean, information will be useless. So, the importance of the information transmitted resides not on the data, but on the people that process, understand and assimilate them [Mansell, 2001:62]. Or in other words, information has to be transformed into knowledge to acquire the meaning that will value it. That is why, current social and technological juncture is known as the *Knowledge Society*, where information has transferred its importance to the knowing processes [Council of Europe, 1997; Mansell, 2001]. Even if the change can at a first sight be considered simple, the underlying principle is a very important one, since individuals have acquired a more active role in all the process. During previous stages, individuals were mainly receptors of information. In the last phase, users of technologies are active participants of the whole process. The final stage of understanding and assimilating the information presented lays on their capacities of recognizing, treating and finally giving meaning to the content. Technologies have not changed considerably, but the way of users interacting with them has completely been transformed.

One of the first institutions to be completely aware of the new opportunities and challenges presented by the technological development was the Council of Europe, who

published a complete report on the contribution of culture to development. Obviously, one of the subjects with which the report, called *In from the margins* [Council of Europe, 1997], deals is the effect of technological development on European societies. Huge amounts of information and data have been done available due to communication technologies and contents can be globally accessed. This publication already stated in 1997 that globalization is an unstoppable process, but some changes may be fostered in order to better promote an equal development for all cultures and individuals. In fact, many international institutions support the idea of the empowerment of individuals and groups in order to make them able to benefit from the potential of technologies. First of all, technologies are not going to be considered any longer tools to obtain mere economic benefits, but mainly tools to foster and reinforce social development processes. After the perspective of the Knowledge Society gained ground, technology will no longer be an aim on itself, but the mediator to broader social and personal objectives. Technologies have lost the meaning on their own, unless they are accompanied by a useful and intelligent utilization by individuals on the pursuit of an objective [Castells, 2002:31]. The main one should be the empowerment of the citizens and their cultural and social development. This process of empowerment should foster human capabilities in order to impel social development of every individual and group. In all this process there are some key factors that have to be taken into account when trying to explain the roots of the Knowledge Society. Technologies can be a mean of reinforcing learning processes of individuals if they are able to fully take advantage of the potentials [Council of Europe, 2000; Jeffrey and Nayman (eds.), 2001].

All these processes of reinforcing and fostering empowerment and creativity contribute positively to the construction of the so-called social capital. Adopting a proper perspective of technological applications can strengthen existing ties among individuals, as well as creating new ones [Zinnbauer, 2007:23]. Those ties are expected to create social networks that will affect social development in many aspects. The interconnection among citizens of a specific group creates a net of relationships that links all individuals. So, these links of the social capital can indirectly impel economic opportunities, political participation, civil engagement and social development [Zinnbauer, 2007:9-10; Cachia et al., 2007:26]. All these facts are an important asset in order to construct or reinforce identity, being it individual or collective. [Lexmond and Wright, 2009:3]. Moreover, closely related to the construction of collective identities, **technological applications have to necessarily become a tool to raise awareness of social and historical knowledge, as well as the**

intellectual enjoyment of cultural contents that root every individual's identity [European Commission, 2002a:14]. This factor has been vital for the current state of promotion of technological applications, since it helps on the process of identitarian construction of national and supranational entities, as well as regional and local communities. Since identities no longer construct around delimited entities and their construction has been de-territorialized, the interplay of individuals and technologies has become central to this process [Steingress, 2002:81-82; Baiget and Guallar, 2009:5-6]. And thus, the agents that become able to better benefit from the potentials of technologies will get a better place on the international arenas.

The diffusion of cultural contents is a safeguard to promote cultural diversity within and outside the societies in which technological applications are being implemented. Inwardly, any individual will be able to promote and spread any cultural content and make it accessible for any other member of his group. Outwardly, any chosen content can be promoted to outer agents in order to make it present in international arenas and, thus, create a unifying sense of community. As expected by the Council of Europe [1997], this reinforcement of the cultural diversity is a real challenge for the previous predominating globalization process, since the former hegemonic communicating operators are facing a proliferation of 'uncontrollable' communication actors and content creators. This new juncture is known as 'glocalization', since it mixes some features of the known process of the globalization with some other of a more locally centred trend. Local agents can create their specific contents and spread them on the global network thanks to the possibilities of technologies. Those local actors will bring specific contents all over the globe with little or no costs for the creator. And the local will become global by a simple way of uploading specific contents to the global electronic network. But, equally, the global penetrates and intertwines with local contents due to the pervasiveness of technologies all over the society. There will no longer be any closed and impenetrable society if any of their devices can be connected to the universal network. Similarly, there will be no unknown and inaccessible society if any member of the community is able to make his group present on the electronic sphere of communication. So, theoretically, there will be no limitation to the presence of any individual or group on all the spheres of live and, consequently, the continuous flow of contents and exchange of ideas is becoming another field of the struggle between subjects and power [Steingress, 2002:79]. Thus, cultural diversity and globalization processes have become clearly intertwined on the so-called glocalization

process and resulting *cultural hybridizing* can be characterized through a multicultural fusion, a synthesis of contacting cultures and coexistence of those cultures, even though they may be of completely different levels [Steingress, 2002:92].

Anyway, as mentioned before, the multiplication of available contents and messages does not per se imply a better use of them, since it requires an active role of the user. Information access does not mean knowledge acquisition, because learning is a continuous process in which every individual builds his own message based on the acquired data. In other words, technological applications are making information more available to users in many senses, but users have to adapt the content to their own mental and intellectual structures to get some meaning [Falk and Dierking, 1992:113]. This whole process is twofold and its first aspect has been extensively covered by the Information Society. Namely, the first assumption of this process is that information is available for all the actors that have to assume and transform it into knowledge. The structure and infrastructure of the Information Society, as seen above, have become extensive and, therefore, the transmission of data is constant, unlimited and available for everyone. The second necessary step for the digital knowledge acquisition process, however, is the boost of an eInclusion process[5] and is not completely established. The pervasiveness of technologies and their extent among many individuals have given them the power to access to information, transform it into knowledge and gain a higher status on society than those who have been left aside of the technological implementation process. Nevertheless, there are some sectors and groups of individuals that are not totally able to adapt to the new technological juncture [Helsper, 2008; Codagnone (ed.), 2009; European Commission, 2007c]. Policies, logically, have to focus on this problem and try to solve it or at least reduce the amount of people on the margins of the new technological development process in order to fully consolidate the Knowledge Society.

Thus, all the evidences point to the consolidation of the Knowledge Society as a fact. Anyway, conversely to the previous stages, it is not based on simple technological developments, but on a change on the perspective of the use of technological applications. Contents are generated either at an international level, either at a local one, but they are always shared on the global network and completely intertwined among them. Nevertheless, information might be available for a previously unimaginable amount of

[5] For further information and a wider explanation on the eInclusion process, see section "2.2.4.- Cultural planning in the European Union: cultural policies for an ongoing political construction process".

people, but mere data have to be transformed into useful knowledge in order to gain some value. This fact requires a more active attitude of technology users and technological devices have evolved in order to cover their real needs and expectations.

Technologies have been enormously evolving during the last decades. At the very beginning, after overcoming an initial military-oriented stage, technologies headed to fulfil the needs of business and financial institutions. Since the establishment of a global network of communication, all kinds of information began to flow all over the Net and cultural institutions became aware of the possibilities of implementing technological applications for the spreading of their existence and contents. Information was, from that moment on, available for anyone capable of accessing the electronic network. But users were passive actors on all the communication process. It has not been until recent times that perspectives on information access have allowed for a more proactive role of users, where the main step of the whole process is the acquisition of knowledge and its adaptation to the mental structures of the users. Thus, technological and social developments have been moving jointly towards the current Knowledge Society.

2.2.2.- Information and Communication Technologies in the last decades

As have been seen on the previous section, the irruption of technological applications on daily life has transformed social structures. The implementation of these applications, however, has not been uniform. Therefore, this section analyses the development of the application of these technologies on the Knowledge Society. First of all, it provides a brief overview on the most important features of the implementation and afterwards presents a description of the main technological applications currently being implemented, as well as an overview of incipient trends, such as the web 2.0 or the Converging Technologies.

All the previously mentioned social and structural transformations have been backed by a considerably rapid development of technological applications for all the ambits of life. Technologies are getting completely embedded in everyday life activities and are, logically, influencing each and every sphere of social activity. Even though at the very beginning technological implementation was done to achieve better performances in exclusively economic and administrative processes, nearly two decades ago it has expanded to cultural institutions [Castells, 2002:51-52]. Currently, in fact, there are continuous flows of people, ideas, values and goods among different communities, even exceeding national boundaries. Consequently, the whole cultural sector has adapted itself to diverse and original technological applications, in order to better fulfil the needs of institutions and users in the increasingly global and competitive interconnected market of the Knowledge Society. This adaptation, partially impelled by external factors of the need of a higher competitiveness

degree in the global market [Peacock 2008a: 340], has been reinforced by recent institutional documents of support, such as the 2003 Report of the European Council of Lisbon, renewing the so-called Lisbon Strategy[6]. That European Council assumed the vital importance that these technological changes will have in the future of the European societies in a more globalized and interconnected market and in the design process of further more transversal policies [ERICarts, 2001:4]. In this new juncture, there has been a significant increase of innovative technological applications related to cultural contents. These contents are one of the implementation fields of the recent technological applications. Consequently, there are numerous cultural institutions throughout the world experimenting with new ways of communication and presentation of their cultural contents, taking advantage of the present technological opportunities. The adaptation of the cultural institutions to the technological panorama is a continuous and never ending process [Peacock, 2008a:346] and that is why the technological implementations adopted by these institutions range from the simple use of multimedia applications on computers to involving virtual 3D scenarios [De Silva, 2003:5]. In this diverse panorama, there have been many attempts to implement innovative technological applications by different museums. Examples of these attempts can be the Minneapolis Institute of Arts that in 1999 made possible to follow the restoration of a painting online in real time [Marty, 2007:338]. Other institutions, such as the Museum Thyssen-Bornemisza of Madrid, have implemented more advanced edutainment applications, because videogames are the entering point for many children to acquire capabilities to socialize in a growing technological environment [Belli and López Raventós, 2008:160] and also to get familiarized with the presented cultural content. Therefore, the panorama of technological implementation in the cultural sector is diverse.

In general terms, an obvious fact is that currently there is an ongoing global technological revolution [Silberglitt et al., 2006:1], in which the availability of information is enormous and not comparable to ever before [Ray and Day, 1998]. Some authors have characterized it as the Third Media Revolution [Bloem, van Doorn and Duivestein, 2009:12]. This Third Media Revolution has its main exponents in the Internet, personal computers and mobile phones, as well as on the overall primacy of the distributive network [Bloem, van Doorn and Duivestein, 2009:16] in contrast to the previous revolutions characterized by the type letters and printing press on the one hand and the electronic mass media on the other

[6] For a broader explanation of the Lisbon Strategy, see section "2.2.4.- Cultural planning in the European Union: cultural policies for an ongoing political construction process".

[Bloem, van Doorn and Duivestein, 2009:15-16, 34]. The differentiating feature of this new situation is that communication and content delivery is distributive among different actors and not only unidirectional. Anyway, the real development is the integration of previously existing technologies and not necessarily the discovering of new ones [Silberglitt et al., 2006:1]. In fact, new technologies never replace the older ones completely, but complement them [Baiget and Guallar, 2009:2-3]. This complementation of technologies is one of the bases of the current convergence trend in technological tools [Silberglitt et al., 2006:1; Bloem, van Doorn and Duivestein, 2009:31, 46]. Or in other words, technological applications and tools tend to converge in order to give more effective answers to current innovation challenges in a continuously changing distributive environment.

Technological innovation, however, in addition to the economic benefit of competitiveness, can also impact social, cultural and political realms, reinforcing human capabilities and processes of empowerment. Actually, technologies are embedded in a social and cultural environment and framework and do not act in a vacuum [Peacock, 2008a:346]. This fact determines technological implementation in a high degree. The European Union, acting as a supranational sociocultural entity, aims at becoming the leading knowledge-driven society, preserving and reinforcing its cultural richness and diversity. This determination has fostered a more intensive technological utilization in society as a whole. Thus, even if at the very beginning the emphasis was on technological and mercantile aspects related to globalization processes [Quéau, 2003], currently it has been transferred to the social capabilities of the technologies for the civic and collective development. In fact, digitisation processes, as well as all the information structures of the cultural institutions have evolved along with technological development [Cole, 2002; Marty, 1999:167-170; Mancini, 2009]. Nowadays, museums and websites are considered multidisciplinary educational centres [Kravchyna and Hastings, 2002] and, consequently, as places to experience with technological applications to foster knowledge acquiring processes of the individuals. Actually, one of the first and main functions of the web technologies broadly implemented by cultural institutions is the content delivery and communication [Choo, Detlor and Turnbull, 2000:1]. In this context, the content and the way it is presented have acquired great importance.

In this new field of action, technologies offer a wide range of opportunities, which should be taken into account by cultural agents as a whole in order to obtain certain pre-eminence

in the relational sphere mediated by technological applications. Lately, the uncertainty related to the implementation of technologies is extremely high and, thus, it can be considered as an ambit of experience and exploration of new potential uses in the cultural realm. Therefore, as happens in any experiencing and exploring process, the risk of failure is high. This way, a resolute wager for a specific type of technology that does not fully respond to needs and expectations of users can lead to the failure of the application or, even, of the whole communication system. Anyway, cultural agents can always opt for a more passive attitude and wait for the stabilization of the panorama on the one hand or for a diverse experience without an evident bet for any technology on the other [Carreras, 2005:180].

Similarly, although cultural operators take full advantage of the potential and capabilities of the process of adopting original technological implementations, they have to bear in mind that the key for success resides on the appropriate utilization by the final users. In fact, many times, even though the application can present multiple options, users tend to consolidate only some of them exploiting merely the ones giving answer to their needs or preferences [Healy, 2002:481]. For this reason, sometimes the wisest way of proceeding is to adopt precise and delimited technological applications, because the less obvious the technological innovation, the higher the risk of not getting consolidated for the proper use [Healy, 2002:481]. This risk can be explained by two factors out of the control of the cultural agents.

- Users can utilize technological applications in ways not expected at the very beginning.
- Users might not choose the highest utilities in terms of productivity and efficiency, but the ones that best suit to their needs and knowledge.

Consequently, final users play a very important role on the configuration of technologies and their utilization, as well as on the consolidation and survival of some technologies in contrast to other ones. In this sense, the capacity of the Internet of distributing any kind of contents [Choo, Detlor and Turnbull, 2000:1; Bloem, van Doorn and Duivestein, 2009:16] has fostered the perception of this technology as superimposed to the rest of communication means, because it embraces all of them. This versatility and robustness is in a high degree the key of the success of the Internet as a technological application worldwide.

Technological innovations, then again, have generated important changes in the ways of production, distribution and access or consumption of digital cultural goods [Healy, 2002; Garnham, 2005:19; Hilbert, 2001:33].

- Contents can be distributed all over the Net quickly at a cost nearly to zero.
- From the production perspective, once the cultural content has been generated, the challenge consists of the way of attracting the attention of the users and to fix the conditions, in which those ones are going to use and experience it.
- From the perspective of the users, however, the problem lays on the decision of which contents are worth of paying attention to among the enormous amount available on the web space. Users can access these contents whenever and wherever and all the content has, in principle, the same specific importance, with no primacy of any over the others [Healy, 2002:480]. Technological operators and agents, nevertheless, have mechanisms and tools to make the presence of some contents more explicit than the others and, logically, to attract and gain the attention of users. In this sense, the cultural capital of agents and operators has a predominant importance.

Finally, apart from the production, distribution and consumption processes, technologies have influenced decisively the evolution of the process of communicating contents by cultural institutions. The necessary readjustment of the basic schemes of functioning of the cultural sector has completely transformed the way contents and messages are delivered and made available to users. Currently there is a phenomenon denominated *Computer Mediated Communication* [Romiszowski and Mason, 2004] or, more generally speaking, *Technologically Mediated Communication*. Until quite recently, the communicating action was based on a linear and unidirectional model, in which cultural agents were active transmitters and visitors passive recipients of the message[7]. **This recent transformation, however, has caused the evolution of the traditional paradigm of communication into a more complex one, where the construction of meaning according to the personal context of the visitor takes the central place of the whole process**. Technologies have been key in all this process, since they have impelled the creation of more continuous and flexible processes in which each individual can adapt the message to his own personal context. The flexibility, accessibility and versatility of technologies when communicating contents have

[7] For a deeper explanation of the communication model, see section "2.4.4.- The changing paradigm of communication".

fostered the perception of the communication as a process where messages and contents are constructed and interpreted differently, according to the circumstances of the recipient. This way, the irruption of technologies in the cultural ambit has also generated substantial transformations in the very cultural object.

As a result of the implantation of all these realities, there is another phenomenon, called sociodigitization [Sassen, 2002]. In the configuration of the relations emerging among organisation, interaction and space, the non-digital component of the context and fields of social relations acquire a vital character. Therefore, the processes of the digital formations are based on the interrelation between the digital and the non-digital, which represents the basis of the sociodigitization. This new phenomenon differentiates from the mere digitisation in the social aspect of the process, as even its name indicates. Digitisation processes are limited to the digital reproduction of a material content, generally related to archives, libraries and so on. Sociodigitization, anyhow, is a more extensive process, where activities of the social sphere are also included in digital codes, databases, texts and images that constitute the basis of the digital formations [Sassen, 2002]. Thus, the main difference between both processes resides on the fact that, while the first one reproduces digitally mere information and objects, sociodigitization also includes logics and relations of the social organisation, the interaction and the space. This way, processes of sociodigitization derive directly from the values, practices, institutions and organisations in which social relations are founded.

The application of digital technologies in material contents create a new content, this time digital, but intimately related to the material environment of production. Consequently, the generated digital object gains hypermobility, due to the possibility of circulation through digital electronic networks with no problem. But, attending to previously explained fundaments of sociodigitization, the hypermobile element will be no other thing than a mere digital reproduction of the original object if there was no permanent relation with the society in which it has been created. The mobile object has to be produced from some immobile capital, but in this digitisation process the first one will lose some characteristics that will remain in the latter. So, there is a dichotomous relation between the *mobility of the capital* or the hypermobile content and the *fixation of the capital* or the cultural capital and the social environment in which it has been generated [Sassen, 2002]. This way, there will

always be a relation between the digital object and the social environment in which it has been created.

2.2.2.1.- Brief overview on technological applications

The new technological juncture presents challenges, but also great potentialities for cultural institutions, being it for the digitisation and preservation of cultural assets, for the creation of digital new ones or for the virtual visit of currently inexistent cultural historical sites. The widening of the access to information and the continuous flows of communication have become the cultural sector a rapidly changing ambit of technological adoption. All these transformations are, obviously, affected by the implementation of technologies as an integral element of the management of the institution and its contents. Even though the main element of any application in cultural institutions should be the content presented, it is crucial to bear always in mind that used technologies can affect the expected outcomes. Logically, the adopted models and services will differ from one institution to another, but there is a clear trend of evolution of the applications jointly with the development of more innovative technologies. In fact, from the simple off-line applications to some current immersive virtual environments, there has been a clear evolution both of technological development, as well as of applications regarding cultural contents. Current more innovative ones allow a higher interaction in real time and a more lively experience to users. Anyway, these recent applications are usually related to the testing of prototypes or to specific initiatives.

Off-line applications

At the very beginning, as happened in all the spheres and environments, the first technological applications in museums were a mere transposition and adaptation of the existing technologies to the contents offered by the institution itself. That is why information points and PC stations can be considered as the starting point of technological implementation at these institutions. The character of these applications, obviously, was quite simple, compared to current technologies' complexity. Those applications presented contents directly related to the exhibition of the institution. These contents ranged from mere complementary texts to images or multimedia that could not be presented other way. In fact, the use of multimedia is more ancient than expected. Even though some people argue that the multimedia began with the massive use of CDs at the beginning of the 90s, some others state than even prehistoric paintings were some kind of multimedia to

illustrate and reinforce the message given orally [Packer and Jordan [eds.] 2001:xxii]. Taking advantage of the creation of those complementary contents, cultural institutions identified a business opportunity by spreading them on CDs and DVDs available at the shop of the institution. Visitors were able to access to the seen contents after the visit, anywhere anytime, but the success of this initiative was not big enough. In fact, the irruption of web technologies and their power of diffusion of multimedia contents have definitely replaced previous media, becoming the most used tool for the global diffusion of cultural contents.

Generally, off-line applications were located either at the very beginning of the exhibition so that users could consult contents before visiting the institution (even use them to orient themselves), or at the end with complementary information about the admired contents [Cameron, 2003]. All that information points and PC stations could only be utilized by a single user at every moment by means of some simple devices such as a mouse or a computer keyboard. After these first attempts, off-line applications began to be included into exhibition rooms, becoming their contents more specifically related to objects present at the space were the device was located. So, off-line applications transformed from points to get global information about the exhibition, the institution or the location, into tools to access more specific information about some determined contents [Cameron, 2003]. At the same time, devices evolved and mouses and keyboards started to be replaced by tactile screens. And not only the devices themselves changed, but also the way of presenting the contents, since mere texts or simple multimedia contents began to incorporate a growing number of more complex and elaborated contents, such as virtual reconstructions or 3D images. Nevertheless, the use of those tools continue being individual, creating crowds around the applications and, consequently, disturbing the correct operation of the traditional visits.

World Wide Web

Internet has been the technological application that exemplifies perfectly the evolvement of the whole technological realm. The very first precedent of this technology can be found on the development of Arpanet in 1969 by the Defence Department of the United States of America for military communication and information sharing [Aibar, 2008:15]. Although this purely military starting point, the further developing factor of this application was the commitment of the academic scientific culture [Aibar, 2008:16]. After some other developments, in 1990 the researcher of the CERN Tim Berners-Lee defined and

developed what from that moment on would be known as the World Wide Web [Aibar, 2008:16]. This definition of the structure and system supposed the foundations of the ground of further development of the web applications. This process, moreover, was fostered and supported by the help of some advanced users under the figure of the hackers [Aibar, 2008:16]. All this development of the web technologies was additionally accompanied by the increase in the number of users. When the first commercial navigator appeared in 1995, it reached 16 million users and 8 years later there were 600 million ones. After 4 more years, however, this amount more than doubled, reaching 1.3 billion users [Aibar, 2008:14]. This rapid increase in the number of users, along with the development of more original and innovative web applications, has become the Internet one of the most famous and well established technologies.

The horizontal character of the web applications makes the integral management of contents by cultural institutions possible. The introduction and extensive use of multimedia on the Net has helped to better illustrate the contents, as well as to make them more attractive and appealing to users [Peacock, 2008a:346; Cambra, 2008:2]. The contents delivered on the web on this stage were linear and unidirectional, making them quite static at the eyes of the users. Web applications, however, have been very important at the time of widening the access to cultural contents among a broader audience.

Another main trend that currently Internet is providing cultural institutions with is the possibility of remembering and re-experiencing the visit after it has taken place or even planning it beforehand. Consequently, cultural institutions, being aware of the possibilities of web technological applications, began a massive implementation of technologies.

Nevertheless, recently there has been a transformation on the conception of the web and all its applications, giving birth to the trend of the so-called web 2.0. Since this term was coined by O'Reilly in 2004, there is an increasing amount of applications that take advantage of collective intelligence for their functioning [O'Reilly and Battelle, 2009]. But more than a technological development, the adoption of the web 2.0 perspective implies a deep change of philosophy when communicating and delivering contents on the digital space [Fundación de la Innovación Bankinter, 2007b:5]. This new vision of the cyberspace consists of a participative web structure, where proactive users contribute with and share unlimited contents and knowledge [Fundación de la Innovación Bankinter, 2007b:21, 65-

67]. Consequently, the web has become a place of meeting, communication and sharing of contents, knowledge and experiences, away from the previous web structure of a table of advertisement or unilateral communication [Cambra, 2008:2]. Anyway, the percentage of users actively taking part in the web 2.0 tools implementation is not higher than one out of ten as the rule 90-9-1 states [Fundación de la Innovación Bankinter, 2007b:27]. This rule affirms that out of a hundred of users, ninety merely consult the contents, nine participate on further processes and only one creates contents for the renewal of the virtual sphere. Nevertheless, the new sites are constantly changing, opposite to the previous static conception of the delivered content [O'Reilly and Battelle, 2009]. In fact, in most of the cases, interaction can be taking place in real time [O'Reilly and Battelle, 2009]. Anyhow, the motivations to participate can be as varied as to have fun, to look for approval, to make friends, to create capacities, to make autopublicity and to trade, among others [Fundación de la Innovación Bankinter, 2007b:12]. **This perception and philosophical change has other collateral effects, since the multiplication of blogs, creation of social networks, use of hyperlinks and hypertexts, among others, has also transformed the way of planning an experience and valuing it after it has taken place** [Celaya and Viñarás, 2006].

One of the main characteristics of the raising trend 2.0 on the Web is the active contribution of users and citizens to the contents presented there [Roush 2005; Gelado 2007a; Fumero and Roca 2007]. That is, the Web has shifted from a mere information-presenting space to a space of social relations. Now the Web needs the presence and active participation of users in order to achieve a greater value. In fact, the higher the amount of individuals making use of the technological applications, the more powerful the services offered will become. That is, the real value of these new services resides on the intensive use of people [Roush 2005]. It is about social interaction, with the exchange and sharing of contents, comments, ideas or knowledge. The growing importance of mobile technological devices (laptops, wireless connection, PDA, mobile phones, etc.) allows the interaction with the Web anytime from anywhere. The latest tools and services, actually, present a clear intertwining of the technological and social spheres, because, although their roots will remain being technological, they are conceived to foster and enable new ways of interaction among people [Roush 2005]. So, the Web has become a platform to foster social computing communications.

But this trend needs some specific tools that allow users to interact correctly with and access to information of this new electronic digital space. Among those tools, the most successful ones are blogs, podcasts, RSS and the social software. There are some sites that make use of these tools as web pages that allow editing content, online collaborative encyclopaedia, photo sharing website, social bookmarking website or search engine that scans entries of blogs and displays the most recent ones, among others.

Blogging [Humphreys, 2010]: The rise of the new social media tools has fostered ways of communication that lay outside the rigid institutional conventional circuits of transmission of contents. In this sense, blogging has become a very popular trend that allows sharing of opinions among different users. In fact, currently blogs are becoming a very powerful tool to create opinion or even to share non-massively consumed news. Consumers of these blogs can easily access, comment the content, contribute with additional information or even communicate with the blogger. As blogs are usually topic-centred, they are very valid tools to create communities of shared interests and tastes. In this sense, museums have identified a useful way of engaging the audience to their contents and events, giving them the opportunity for a more fluid communication with the institution, as well as of better delivering the contents in a more personal and personalized way. Blogs tend to use a more colloquial style than the official institutional websites and, consequently, they can more easily attract and retain the audience. This way, museums have started to implement within the official websites blogs related to their contents and events. When the institution itself is the responsible of creating the content, the blog acquires a more official character, supported by the aura of authenticity that the museum gives to everything derived from it. Some good examples of this case can be the blogs of the Chicago History Museum[8], the Indianapolis Museum of Art[9] or the MoMA – Museum of Modern Art[10]. Anyway, this trend of creating blogs is rapidly developing and spreading among many museums, since their popularity is growing.

RSS and the feeds[11]: RSS is a sublanguage of the XML, but the meaning of the acronym is not clear, due to the struggle between *Rich Site Summary* and *Really Simple Syndication*. This language is used to distribute contents over the Internet, which is called to syndicate. It goes a step further than the mailing lists, because the syndicated contents can be either

[8] Chicago History Museum Blog: http://blog.chicagohistory.org/ (Last accessed 2010-11-24).
[9] Indianapolis Museum of Art Blog: http://www.imamuseum.org/blog/ (Last accessed 2010-11-24).
[10] MoMA Blog: http://www.moma.org/explore/inside_out (Last accessed 2010-11-24).
[11] Euroresidentes: http://www.euroresidentes.com/Diversion/Internet/rss.htm (Last accessed 2010-05-12).

news, entries of blogs or any other information and are identified by a title, an abstract and a link. Sometimes, however, the RSS feed can contain the whole new or entry. The subscriber to the RSS feeds can link them with his personal website or homepage, such as Yahoo or iGoogle. If there is any new content, the subscriber will get a notice and the description of the content in the space they have chosen. The RSS feeds are an option of browsing specific contents without having to enter to the specific website, just in case they want to get more information, and they allow users to have news or content of third parties in their own page. The RSS feeds can be read using the RSS readers, called aggregators. In some sense the user does not have to make any effort to get the information, because, once subscribed to the source, the information arrives at the user automatically. There is a growing number of websites that adapt their contents to the RSS feeds in order to get to a broader audience in the easiest way and there are also many innovative projects, such as RSS as instant messaging, RSS as mail messages or bookmarks as RSS among others. The Educathyssen website offers the possibility of subscribing to the RSS feeds of its weblog.

Social bookmarking [Surowiecki, 2007]: Social bookmarking is based on websites where people can save their bookmarks as if they were their own computer. However, they can access their bookmarks from anywhere, as they are stored in the Net. Nevertheless, the added value of the website is that, if users want to, the collection of bookmarks can be public and shared with other users. Bookmarks can be searched, because each user describes those using tags, which are one word descriptors. Users can use as much tags as they want and, as they are personal, the organisation of the bookmarks is not as strict as in traditional folders system. Anyone can search for a specific tag and get the whole collection of bookmarks. Once the bookmarks are accessed, users can also add them to their own collection with their own describing tags. The most used tags are ranked higher than the other ones and as a consequence, also the bookmarks with the most used tags are ranked in the first positions. One of the sites that work with social bookmarking is Delicious[12]. This site can create communities of shared interests and that is why it is called social bookmarking. So, Delicious is also a tool for organizing and ranking the digital space of the web. The Educathyssen website, for instance, has inserted its own bookmarks into Delicious.

[12] Delicious: http://www.delicious.com (Last accessed 2010-05-24).

Podcasting [Gelado, 2007a; Gelado, 2007b; Roush, 2005]: It is an amateur or a professional way to distribute contents through the Web. The audio contents can be distributed in mp3 format and the only thing users have to do is subscribe to the podcasts delivers or shows they want in order to get them into their own computer or mp3 device. Another variant of the podcasting is the so-called videocasting, in which the mere audio file is replaced by a video one. Podcasts and videocasts can be downloaded and used in any compatible device, such as mp4 players. The success of the iPod players has helped podcasting to become more famous than even before. Podcasts can be used as normal audio or video files: play them whenever the user wants, forward some parts, repeat others, and so on. Great firms, universities and many cultural institutions are aware of the potential of podcasts for learning, marketing or as a direct channel between firms and consumers. Currently, the Art Institute of Chicago website has the possibility to download some lectures and information on concrete contents.

Microblogging: Microblogging is based on short messages broadcasted by users. All these short messages are usually related to updates of status, activities or contents of the microbloggers [Ehrlich and Sadat Shami, 2010:42]. The main difference with other kinds of communication resides on the brevity of the broadcasted content [Humphreys, 2010], because the usual space of publishing is around 140 characters. This shortness of the messages derives from the very initial notion of the microblogging via mobile devices and telephones. Being it so, this new model of communication is based on instantaneity and, thus, it is considered optimal to share information about ongoing events [Ehrlich and Sadat Shami, 2010:42]. After having created a profile, anyone can become a *follower* of any other users and receive each update of the status. Consequently, organisations and institutions can announce forthcoming events or updates of contents and make them available immediately to all their followers in microblogging sites. Anyhow, this model of communication is not completely original, since it has some similarities with the brief entries in personal agendas [Humphreys, 2010] and with traditional announcements on institutional blackboards in terms of style, content, publicness and length of the messages [Humphreys, 2010]. A crucial difference, however, is that the broadcasted content instantaneously reaches the subscribed follower with no need of effort by the latter one. Consequently, individuals, institutions and organisations can spread their contents and updates immediately with no additional costs. Currently, there are numerous sites that

allow the microblogging, such as Plurk[13] or Tumblr[14], among others. Nevertheless, the most popular one has become Twitter[15], where the messages of users are known as tweets and can be received on the own site, via SMS, RSS or, even email. Among the many users of this new social type of communication, the Brooklyn Museum[16] and the J. Paul Getty Museum[17] are making use of the potentialities of Twitter and the microblogging.

Web 3.0

It will be worth to mention the ongoing panorama of gradual implementation of the web 2.0 applications. Some authors, such as Surovy (2007), Fuchs et al. (2010) or Raffl et al. (2008) among others, are defending the irruption of another evolution of the web, namely the 3.0 version. Even though there is still no clear definition of what should be understood as web 3.0 [Silva, Mahfujur Rahman and El Saddik, 2008:9], there are some common features that all of the definitions stress. First of all, web 3.0 is perceived as an evolution of the current web, with the additional characteristic of being a Semantic Web [Neβelrath, 2006:2; Silva, Mahfujur Rahman and El Saddik, 2008:10; Surovy, 2007:12]. The definition of a Semantic Web implies that search engines would understand the information and its structure exactly as humans do. In this new context, searching engines will not only look for the existence of the queries, but will get its meaning and adjust the results to the needs of the user [Surovy, 2007:12; Silva, Mahfujur Rahman and El Saddik, 2008:11]. This new way of searching could be based on the adoption of ontologies to structure and organize contents and on the *Ambient Intelligence* and *Context Awareness* [Silva, Mahfujur Rahman and El Saddik, 2008:12].

On the other hand, the web 3.0 model will be pervasive and ubiquitous [Silva, Mahfujur Rahman and El Saddik, 2008:9, 12; Surovy, 2007:13]. This new scenario will allow access to the digital contents everywhere by means of using any mobile device. Moreover, also the content presented on the web will slightly differ from the current one. The web 3.0 will be more media centric than language-based and 3D contents will have a greater presence and importance [Silva, Mahfujur Rahman and El Saddik, 2008:11-12; Surovy, 2007:13]. Finally, but not less important, this web 3.0 model will have a co-operative character [Fuchs et al., 2010; Raffl et al., 2008]. The evolution of the web has not only been technological, but also

[13] Plurk: http://www.plurk.com (Last accessed 2010-11-23).
[14] Tumblr: http://ww.tumblr.com (Last accessed 2010-11-23).
[15] Twitter: http://www.twitter.com (Last accessed 2010-11-23).
[16] Brooklyn Museum Twitter profile: http://twitter.com/brooklynmuseum (Last accessed 2010-11-23)
[17] J. Paul Getty Museum Twitter profile: http://twitter.com/GettyMuseum (Last accessed 2010-11-23)

philosophical [Fuchs et al., 2010:52; Raffl et al., 2008:607-608]. At the beginning, the web could be defined as cognitive, where individual users were the only subject of production of content. During the web 2.0 stage, communicative communitarian processes of sharing knowledge and interests have taken the central place. With the implementation of the web 3.0 philosophy, however, this trend will be complemented by a co-operation process. This co-operation will not only be understood as human collaboration as happens currently, because the ontological level will also allow a more precise co-operation that takes advantage of the collective knowledge and intelligence [Raffl et al., 2008:608]. Consequently, this co-operation will go a step further of the current social collaboration [Raffl et al., 2008:608]. Anyhow, as the web is constantly evolving, is hard to clearly define or describe not only the long-term future of these technologies and applications, but also the most immediate one.

Virtual Reality

The Virtual Reality is gradually being introduced in the cultural sector, as a mean of creating virtual places that no longer exist or, even, that have never existed[18] [Artnouveau, 2003]. Due to the complexity of the implementation of this technology, currently there are not too many applications that make use of it. To allow the interaction with the virtual place or the images, users have to wear some interfaces, such as helmets, glasses or haptic devices. This can be considered, along with technical problems of the technological implementation, as one of the main factors of the slowdown of this technology, because users cannot act as naturally as expected. Among the range of potential applications of the Virtual Reality technologies, the creation of immersive environments gives the opportunity to users to penetrate into a place of virtuality [Artnouveau, 2003]. The need of big technological infrastructures for the visualization, jointly with the rigid structures of traditional cultural institutions that can be disturbed by their presence, has hindered a broader implementation of this kind of applications. However, some cultural institutions are trying to make use of these potentialities and reconvert them into usable web applications contents. In this sense, some institutions have begun to create virtual reproductions of their physical installations and holdings. This creation of virtual museums permits users to wander around the digital version of the institution, as well as to observe the contents presented there. In these environments, moreover, the possible implementation of avatars or virtual characters can play a key role in further development

[18] A variant of the Virtual Reality is the Augmented Reality, where the superposition of virtual images occurs in a real place. Consequently, there will be an intertwining of the reality and the virtuality.

of applications for cultural institutions [Artnouveau, 2003]. These avatars aim at improving the interaction between the visitor and the presented information, as well as to serve as a virtual guide through the virtual representation of the institution or site. All these technological applications, anyway, require great resources not only in the material realm, but also in relation to network consumption for their web implementation. That is to say, contrary to some more simple technological applications, Virtual Reality ones require great resources to be delivered through the Net and get accessed by the user. Among the many examples, the use of Cave Automatic Virtual Environment (CAVE) systems deserves to be mentioned. These technologies have been useful to replicate cultural contents in immersive environments. A clear example of this utilization is the Tholos Virtual Reality Theatre at the Foundation of the Hellenic World in Athens.

Mobile devices

Traditionally, the link of mobile devices and cultural institutions has been made by the use of the traditional mobile guides or audioguides. These audioguides support the user while visiting the institution and its contents. The interaction has been minimum, since the device delivers the contents once the user has selected the desired content. In fact, the added value of these first implementations of mobile devices resides on the provided information and on the way of presentation. Currently, however, the unexpected expansion of the mobile telephony has reshaped the sector, opening new opportunities for content delivery and access. The penetration rate of the mobile phones in the market is around 61.0 per cent and represents about 4 billion users, nearly four times more than the Internet users [Fundación de la Innovación Bankinter, 2008:22]. This fact is more important than can seem at a first sight, because for at least a half of the users the mobile phone will be their first phone, but also their first camera, music player and, of course, Internet access [Fundación de la Innovación Bankinter, 2008:22]. The growing completeness of the terminals, with increasing number of applications, has become the mobile phones a really popular device, thanks, mostly, to the simplicity of most of those applications. Actually, the potential of growing of the mobile devices, exemplified by the advanced mobile phones, is superior to the one of the Internet, because they better adopt to the current 'nomad' way of life of individuals, allow instant localization and access to the desired contents, support a high degree of personalization and can open access to contents to a previously excluded broad part of the population [Fundación de la Innovación Bankinter, 2008:35]. In this sense, there is a wide range of possible applications of cultural contents with mobile

devices. One of the first ones can be the translation of the audioguides idea to the new mobile devices, with no necessity for users to manually choose the content, but fostering automatic recognition and delivery of the contents. Even more, taking into account the scope of action of the mobile telephony and its structures, applications can be implemented with no signal problems not merely in closed and relatively small areas, but also in open ones, such as cities, regions, cultural or archaeological sites, among others. According to these facts, the appealing character of the mobile technologies is great, but, actually, the degree of their use is quite disappointing, because most of the users do not opt to utilize the available services [Fundación de la Innovación Bankinter, 2008:74]. Among the factors for this underuse, the great fragmentation of the market, privacy and security fear issues, the high costs of services and devices, problems with these latter ones and the limited capacity of the networks to support all the services are the most prominent ones [Fundación de la Innovación Bankinter, 2008:35]. Consequently, even though the capacity and potentiality is great, there is a long way to do until the optimum use of mobile devices with cultural contents and applications is reached. This process of development has to occur both in the technological sphere, as well as from the perspective of the final user. Mobile devices have opened up enormous possibilities for the cultural technological implementation, but the adaptation of content producers, implementers and users is slower than expected.

Converging Technologies

Quite recently, the irruption of the so-called Converging Technologies has begun to transform the field of the technologies. Even though they are not a specific type of applications or devices, the Converging Technologies aim at completely reshaping the current state of situation of technological applications. More than a technological development, the irruption of the Converging Technologies implies a philosophical and theoretical evolution. The European Union pledges this new perspective [Nordmann, 2004; Bibel, 2004], defining them as *Converging Technologies for the European Knowledge Society* (CTEKS). Already established technologies, such as information and communication ones, biotechnologies, nanotechnologies or, even, cognitive and neurosciences, have fostered the development of societies being applied separately. Their convergence, however, can result into one of the first great research initiatives of the 21st century [Nordmann, 2004:2; Bloem, van Doorn and Duivestein, 2009:31, 46; Silberglitt et al., 2006:1]. The use of the expression Converging Technologies denotes that their application is addressed at a common single

objective in any human activity field. So, convergence means creating synergies among different related sciences and technologies in order to give the best solution possible to a specific problem. Consequently, Converging Technologies are technologies that enable from different perspectives reaching a common single objective [Nordmann, 2004:14]. In this synergies creating process, each technology takes the responsibility of facing the challenge from a different perspective, trying to find different concrete solutions.

In the case of the information technologies, they can be defined as Converging Technologies, since their development and implementation foster the convergence with social change processes. So, the use of information technologies supposes the combination of concepts of different cognitive systems or, in other words, the unification of previously isolated and unconnected spaces and areas. That is why ICT have impelled the creation of synergies and spaces of shared sociocultural practices.

On the other hand, there has been recently a progressive process of miniaturization on the devices used to present and communicate cultural contents. Therefore, nanotechnologies can be considered Converging Technologies for cultural institutions, because they foster the creation of suitable systems and devices in a smaller scale and that, probably, will better adapt to the potential expectations of the users.

Generally, Converging Technologies have two clear characteristics regarding technological applications with cultural contents.

- On the one hand, they tend to be integrated within different human activity spheres. They aim at being present in different ambits, but trying, at the same time, to go as unnoticed as possible. In this sense, Converging Technologies, as well as any technology, will better reach their objectives the lesser their degree of perceived presence for the users [Healy 2002:481]. Consequently, the miniaturization of information and communication technologies represents an important advance for the integration of many fields, such as work or leisure.
- On the other, the specificity of these technologies is a basic characteristic, since this tendency defends that the different technological perspectives to give concrete answers to specific problems. This fact does not suppose leaving aside a broader horizon, but taking into account that the sum of small specific responses can lay

the foundations of greater solutions to contribute to an active way of reaching a common objective.

As have been explained, the promotion of Converging Technologies is a tendency that is beginning to take place within the current panorama of technological applications. Even diverse political spheres are encouraging the collaboration and synergies creation among different types of technologies for the pursuit of a common objective. That is why one of the main current challenges for a near future is the full performance of the potential of the Converging Technologies. Anyway, there has to be a process of concretion from the current theoretical stage. As usual in all technological implementation process, there is an obvious percentage of failure that has to be recognized [Carreras, 2005:180].

Structural changes derived from the irruption of the Knowledge Society have been backed by the massive implementation of technological applications. This technological revolution has fostered social and human empowerment processes. The instantaneous and free access to contents has widened the potentialities for all kinds of individuals and institutions. However, ranging from off-line applications to current advanced Converging Technologies, the panorama of technological implementation is varied and constantly changing. The new Social Media tools have turned communication into an interactive dialogue, enabling substantial changes to organizational management and individual participation.

2.2.3.- Cultural policies: challenges in the current Knowledge Society

Being an important social and economic sector, as explained on the first part of this section, culture has never been left outside of the institutional planning framework. In fact, cultural strategic planning has a long tradition, due to the explicit but also to the more profound implicit influences on society and individuals it can foster. In order to delimit any cultural policy, institutional bodies always take side on the ongoing theoretical debates. In this sense, the section analyses the debates on cultural democratization and cultural democracy, as well as on the centralization and decentralization one. Besides, once the cultural policy has been established and all its objectives identified, the cultural decision-maker has to diligently carry out a continuous follow-up evaluation process. That is why the section finishes by providing an overview of the main aspects of cultural policy evaluation.

Being part of the integral socioeconomic system, culture, obviously, needs also a political framework to be sustainable and balanced, as well as maintain its richness and vitality. So, cultural policies, along with many other fields of political action, have come to the fore of

institutional agendas, due to the great economic impact of the activities related to them. In this situation, however, it is extremely important to bear in mind that any kind of policy is result of the ideology of the institution that has developed it. In other words, any policy, be it cultural, social or economic, pursues an ideal scenario for the future to design and promote actions in order to achieve it. In fact, cultural policies are closely linked to an effort by political powers to symbolically legitimate their order and presence, not only during past times, but also nowadays [Ahearne, 2008:3; Sassatelli, 2006:24].

Apart from this sometimes non-obvious target of cultural policies, one of the main roots of any political planning is that, in order to be feasible, it has to represent a clear balance between the aspiration and the resources of the entity that is going to apply it. That is, the planned actions have to take into account the real possibilities of implementation [Wildavsky, 1993:3], because any utopian measure will never succeed. That is why, many times, initial aspirations and planning have to be readjusted according to the available resources. The planning of a cultural policy, as well as any other policy, does not mean taking some specific or punctual action, but the implementation of a holistic idea of how to act to answer some defined issues. Cultural policies have to be the global essence of actions concerning culture, and not punctual and isolated ones. Thus, cultural policy means an active way of taking part on decision making processes by political institutions on the cultural realm. Consequently, any cultural planning is just the reflection of objectives and aims, being them explicit or implicit [Ahearne, 2008:3]. Many times, moreover, implicit aims have more profound impact on the long term.

Even currently, on the European national and international panorama, culture and cultural policies are still being used as instruments of justification and reinforcement of a political, social and economic project [Sassatelli, 2006:24]. Cultural policies are by definition national policies [Cunningham, 2002:8], but, once the national belonging sentiment has firmly laid its foundations, supranational entities have realized of the potential of these policies to ground their aspirations. This supranational framework for intervention is perfectly exemplified by the European Union [Cunningham, 2002:10]. Its cultural policies try to create and reinforce the feeling of belonging to the European citizenship and share some common values and ideas. As can be seen, so, culture has been used to achieve certain specific aims throughout different spaces and times. The main difference, however, resides on the equilibrium between the right freedom of cultural action and the institutional use.

This fact does not depend on culture itself, but on politics and decision makers of the whole planning process.

Besides the possible utilization in order to create or reaffirm belonging links among citizens, institutions are aware of the value of culture as economic driver, educational asset, civic catalyst and legacy from the past [NASAA, 2010:2; Throsby, 2003:139]. All these beneficial impacts are key for the resolute public support of the institutions to cultural policies. Even though some people claim that this support can also be done through private initiatives, institutional ones are addressed to ensure fair and egalitarian access to cultural resources, meet real needs of the community in cultural issues and reduce barriers to participation in the arts, among others [NASAA 2010:5-6; Throsby, 2003:161]. That is why cultural policies are supported mainly by public initiatives and funded in order to ensure that the benefits of cultural consumption are equally shared by all members of the community.

On the other hand, being aware of the risks of an unsuitable planning or a deliberate misuse of culture, decision making processes contemplate different debates and trends when designing the cultural action of any political institution. In fact, the position concerning these debates will be the main configuring feature of the whole cultural policy, since it is going to determine the specific attitude when facing concrete actions.

One of the first debates that every design and strategic planning has to face is the way of choosing the cultural assets that are going to be supported and fostered. At the time of choosing the cultural assets and resources to be supported, there have been, once overcame the trend of the cultural patronage, two main perspectives, namely cultural democratization and cultural democracy [Fernández Prado, 1991; Bennett, 2001]. The first policy approach, created on mid-20th century on Western Europe, impels the spreading of excellent artistic production to the mass audience, ending with any possible elitist cultural monopoly. In other words, **cultural democratization** aims at expanding the so-called high culture among cultural consumers. Institutions are protectors and keepers of excellence and geniality of cultural creators and producers. Hence, institutional support fosters the creative genius in order to produce cultural assets to be spread among popular classes. Individuals, logically, are perceived as passive receptors of culture and, consequently, are educated on specific and delimited cultural values and meanings. One of the main critics to this cultural

supporting perspective, however, resides precisely on this paternalist dirigisme, since there is an obvious risk of disconnection between what is provided and what is really asked by community and individuals. If this disconnection happens, it also represents a great deficit of representativeness and communication of the majority with institutional cultural offer. Anyway, the cultural democratization has achieved two main accomplishments. The first one is that culture was for the first time considered a topic worth of public and institutional support. On the other hand, moreover, this trend has spread access to cultural activities widely among individuals, since most of the actions planned within this framework are oriented towards the diffusion of cultural contents, even though it can be representative of only certain elitist sectors.

The other main approach, as mentioned above, is **cultural democracy** [Bennett, 2001; Fernández Prado, 1991]. Conversely to the previous planning philosophy, cultural democracy does not seek the diffusion of high culture among popular classes, but ensuring the cultural pluralism, promoting direct access of the totality of the individuals to the cultural life of the community. That is why one of the premises of cultural democracy is to impel the formation of a critical mass of citizens able to create their own ways of cultural expression. These expressions should reflect the connection between culture and society itself, because pluralism would be the result of an effective answer to the real needs of individuals. This approach, consequently, fosters cultural creation, in which individuals are active part on the process of conforming a communicative and representative culture. Thus, citizens have transformed from passive consumers into active agents of the cultural process, which pursues the reinforcement of culture and society. This cultural policy trend emphasizes clearly the role of individuals on this permanent social learning process. This perspective supports a non-elitist, popular culture, where cultural expressions as video or photography are also considered worthy cultural activities. This opening of the support to previously misconsidered expressions, moreover, has been key for a broader participation of different groups of individuals on the cultural life of the society. Anyhow, there is a quite clear populist character on this philosophy, which can even be unfavourable for cultural life itself, since, if any cultural expression has the same value, geniality and excellence will not be supported and it can lead to a global cultural value decrease.

Even though these two cultural policy approaches seem to be founded on opposite principles, they have not to be observed as isolated and incompatible, because actually the

institutional and economic systems support both excellence and creativity [Garnham, 2005:28]. Although cultural democracy claims for a pure popular and free creativity, economic system is not able of assimilating it. Consequently, the previously explained creative industries respond to the cultural tastes, needs and expectations of massive consumers with the hit contents. Other kind of needs, nevertheless, are financed, supported and provided by institutions, trying to cover possible gaps of the market. So, excellence is supported by institutional action, while creativity for popular tastes is fostered by private profit-oriented industries. Thus, both sides of cultural consumption are covered by the combined action of public and private initiatives.

Similarly, the contraposition of **centralized and decentralized cultural planning** deserves also a very careful analysis because of the increasing importance of decentralisation processes nowadays [Bassand, 1992; Cardús et al., 1991; D'Angelo and Vesperini, 2000; López de Aguileta, 2000]. This difference at the time of planning cultural initiatives and actions has more profound impacts than the merely cultural ones, since the adoption of one approach or the other will have significant consequences on the territorial organisation of the community itself due to the spatial distribution of the resources. On a centralized perspective, cultural resources and installations will gather around some specific areas, creating spaces of a great cultural concentration. This process can even create a so-called 'star system', where some institutions or resources are the primary ones, while the rest are left aside in a huge degree. Anyhow, the centralized view of cultural planning ensures a better control of standards and production, as well as a greater commitment of governmental institutions to culture [Matarasso and Landry, 2000:48-49]. The decentralizing trend, however, depends greatly on the predominant ideology on the institutions of each community and their respective degree of decentralization of cultural competences. There are, anyway, many issues to be observed before adopting any of these perspectives, in order to avoid potential risks.

Currently, the excessive bureaucracy and technocracy have separated cultural production from the citizens. In fact, in many cases, along with the lack of democracy of a highly centralized cultural production, this fact has led to a progressive decrease of reflection of the cultural reality of the community. This is the reason cultural decentralization to be considered as a potential solution to this kind of risks. But, taken to the extreme, cultural decentralization can be associated with the creation of territorial disequilibrium. A wrong

balance of the decentralization can favour some specific regions or areas, unavoidably impelling a clear deficit when promoting an egalitarian access to culture. This risk should not only be considered in national terms, but also on local, regional and even supranational ones. Besides, the implementation of any decentralization process brings, inherently, the recognition of the pluralism within the community. An excessive decentralization, however, can unintentionally lead to an atomization process that would be a serious obstacle for any further integration of the parts. Equally, decentralization processes can help avoiding technocratic and bureaucratic institutional complexity, because decision making instances are geographically closer to the totality of the citizenship. This proximity fosters a higher influence of individuals on the decision making processes, jointly with a theoretical simplification of the bureaucratic tasks. Nevertheless, an inappropriate cultural policy could mean a multiplication of the levels of bureaucracy. Or in other words, if decentralization is conceived as a mere local translation of central instances it will simply multiply bureaucratic issues. Because decentralizing does not mean multiplication of levels, but a logical implementation of the subsidiarity principle. Summing, up, if decentralization is done rationally, it will lead to a closer and simpler decision making for the individuals; if it merely implies a simple multiplication of levels, however, it will lead to an atomizing process and to a progressive distance with the citizens due to the multiplication of bureaucratic tasks.

These two policy approaches, as seen on the previous debate about cultural democratization and cultural democracy, should not be conceived as separate and isolated, because the combination of the positive aspects of both of them will lead to a more effective and efficient policy planning [Matarasso and Landry, 2000:48-49]. On the current technological juncture, however, there is another factor to be taken into account, because digital possibilities for production, distribution and access to cultural contents have reshaped the above explained dichotomy. Nowadays, cultural production can be made anywhere and cultural consumption is spread globally. Consequently, when producing cultural assets, local producers and contents have a greater importance than ever before. Besides, these local contents can be accessed globally by anyone able to get connected to their network of flow. Hence, the so-called process of glocalization [KEA, 2006:38; Steingress, 2002:79-80] has completely reconfigured the perspective of the centralization and decentralization of the cultural initiatives. Thus, **cultural policies have to observe this new reality in order to correctly address the needs of the citizens on cultural terms on this new technologically interconnected panorama**.

Very closely related to the previous two debates, on the other hand, governments can adopt many different forms of cultural agents. The first model has also been chronologically the most ancient one, since during European Renaissance states acted as patrons under the form of Maecenas [Craik, 2007:1]. Within this patronage framework, cultural excellence was nurtured and fostered. But political milieus were the ones declaring which content was worth of being declared excellent or not. Even though in the patronage model political powers shaped the excellent tastes of the citizens, the architect model is directly related to some kind of governmental body and presents a more interventionist character [Craik, 2007:1]. This culturally competent institution will support and impel initiatives aligned with broad social welfare and national cultural aims. Anyway, the most interventionist and politicised model is the engineer one, where state and the regime are the real modellers of the cultural life of the community [Craik, 2007:1]. Cultural creators and producers will only create contents that will reflect political objectives of the state. This model was broadly implemented on the communist regimes [Dragicevic Sesic and Dragojevic, 2006:50], where culture was used to worship the figure of the leader, as well as to praise the goodness of the regime. On the contrary, on the fourth model, namely the facilitator one, institutions look for a support of the diversity when producing cultural assets by funding diverse organisations and individuals for their commercial survival [Craik, 2007:1]. Conversely, to what happened on previous models, this one not only supports the contents clearly aligned with the governmental ideology, but a wider range of them. A variation of this model can be considered the elite nurturer one [Craik, 2007:2]. In this case, institutional funding and support is addressed only to a few elite organisations, so that they do not have to compete with the other cultural institutions. Compared to the facilitator model, the elite nurturer one allows very little degree of experimentation, due to the he amount of the cultural budget conceded to the chosen elite organisations.

Having adopted one of these models, however, all governments and institutions conceive cultural policy under the umbrella of the instrumentality [Craik, 2007:25; Royseng, 2008]. This instrumentality perspective means that culture is not only supported by the value of cultural assets per se, but also because of other beneficial impacts deriving from them. Culture is never seen as an isolated entity, since it is part of a complex system of relations and networks that drives social changes as a whole. Culture can obviously be used in order to reinforce communitarian sense of belonging, but also implicitly to leverage social

problems such as unemployment or alienation [Craik, 2007:25], or similarly also to positively impact health policies [Royseng, 2008:5]. Thus, cultural policies are perceived as ideal complements for other political planning areas and, consequently, they are instrumental to better achieve results on the whole social system. It is crucial, however, to bear always in mind that any change on cultural planning can also affect other unexpected fields.

Finally, when planning a cultural policy it is extremely important to take into account its process of decision making and further evaluation [Gray, 2008]. The first step of any philosophical framework has to be clearly to get to know the surrounding reality, since any cultural policy has to answer to some specific needs of the citizens of the community [Bonet, 2003; D'Angelo and Vesperini, 1999; Fernández Prado, 1991; Carrasco Arroyo, 2006]. After knowing precisely the environment, every institution is responsible of setting a precise and delimited cultural mission. Even though this mission has to address an ideal future scenario, each and every action derived from it has to be fulfilled in the limits of the resources of the community. Anyway, the first step is to define some strategic objectives, abstract and ethereal, such as human and social development of the peoples, recognition and valuation of the diversity, and so forth. These strategic objectives will be the philosophical action lines of the whole cultural planning, but they obviously have to be translated into a more realistic sphere of concrete and reachable actions. That is, abstract lines of action have to be reproduced on a more material way [Bonet, 2003:16]. This stage of the legislative process is extremely important, because the decision makers have to adjust the initial cultural objectives to the existing resources. Consequently, this step implies the evaluation of the resources available that will foster cultural initiatives on the way of achieving the primary objectives, ensuring at the same time the solvency of the whole cultural policy. Once these operative aims are defined and chosen, some instruments and actions have to be designed by the policy makers. Generally, these instruments are integrated into broader programs of institutional and material support, which will determine the strategic and operative objectives of each one. According to this delimitation, finally, political institutions and cultural organisations will know the available resources to achieve each concrete aim of the cultural policy.

Nevertheless, the labour of the decision maker does not end at this point, since once resources are conceded to cultural agents, there has to be a continuous evaluation process

of the cultural policy itself. This evaluation process is twofold, because it will measure on the one hand the efficiency of the resources and on the other the effectiveness of the policy [Bonet, 2003:15]. During the first stage, the evaluator has to create some process indicators to measure the efficiency of the allocated resources for the consecution of the main aspirations of each program. Within this first phase, indicators determine if assigned resources are valid, which is known in policy analysis as the measurement of the efficiency. On the other hand, also effectiveness of the cultural policy should be tested. The indicators for this step will be known as result ones and will be applied in two phases. First, these evaluation indicators will determine if cultural programs are valid to reach the operative objectives of the cultural policies and, on second place, the indicators, probably different from the previous ones, will determine if defined operative objectives are the suitable ones to achieve the primary strategic ones. Or in other words, the effectiveness evaluation will define how material punctual actions help the decision maker to get closer to the ideal scenario draft out at the initial stage. So, effectiveness of any cultural policy is the direct correlation between punctual actions on the process of reaching the ideal cultural scenario for the future. Consequently, after having designed a cultural policy, all decision makers have to evaluate and measure the defined actions. Many times, indicators reveal that planned actions are not the most suitable ones and the legislator has to face the remodelling of the cultural policy [Bonet, 2003:15]. Most of the times, however, there is not the need of a complete reshaping of the cultural policy, but the creation of specific actions addressed to fulfil gaps on the primeval cultural planning. Cultural policies, besides, are in constant change of initial scenarios and planned actions, because they have to face developing realities and answer to new needs of the individuals.

The relationship of culture and policy has been at the heart of debate since ancient times. This relationship is clearly bidirectional, since culture legitimates or refutes cultural identities and political projects on the one hand and on the other it clearly needs a regulatory framework that ensures its survival and renewal. From the early Maecenas figure, cultural policies have evolved together with social and historical events. Even currently, cultural policies find themselves struggling in the middle of the debates about centralization or decentralization and cultural democratization or cultural democracy, among others. Nevertheless, once the policy is settled, institutions have to carry out a constant evaluation in order to adapt policies to the changing junctures, testing their efficiency and effectiveness. Since cultural creation and production processes have been reshaped by the new socio-technological juncture, cultural policies should also move towards this new situation in order to better face the challenges of the cultural sector in the increasingly digital environment.

2.2.3.- Cultural planning in the European Union: cultural policies for an ongoing political construction process

If cultural policies have been used throughout the whole history to legitimate and reinforce feelings of belonging, currently the European Union is also making use of it to achieve a greater cohesion among Member States. Apart from punctual initial actions, since the adoption of the article 151 regarding culture of the *Treaty on the European Union* [C/191/1992] signed on Maastricht, the communitarian planning has developed following also more general trends. The section provides an overview of the different phases of the European cultural policies, beginning from the early formation and education phase and reaching at the current creativity and innovation one. Recently, moreover, communitarian institutions have taken consciousness of the importance of not leaving aside anyone from the ongoing technological implementation processes and have adopted some initiatives on the eInclusion of the citizens. The section, consequently, finalizes giving a brief overview on these recent inclusion initiatives.

A clear example of all this cultural planning development, as will be explained subsequently, is the cultural policy of the European Union from its very beginning until nowadays. The policies drafted out by the communitarian institutions have two peculiarities. Since the European Union is a political entity in continuous transformation and still under construction, its political planning adjusts more easily to the changing circumstances of the surrounding. Moreover, the European institutions do not adjust to the traditional and strict figure of national institutions and their way of acting and planning is more flexible [Sassatelli, 2006:31]. That is why European cultural policies can serve as an optimal practical example of current planning in this field of action. The importance of culture to the main planning processes of the European Union is relatively recent [Obuljen, 2005:11; Meinhof and Triandafyllidou, 2006:3]. Nevertheless, nearly since the beginning of the European unification process some cultural actions have been carried out by the Council of the Ministries of Culture of the Member States. They used to adopt recommendations and resolutions related to more traditional aspects of culture, such as different artistic representations, actions concerning cultural heritage or the creation in 1985 of the European Cultural Capital [85/C 153/02]. But, advancing one step further, the European Union decided to introduce culture on the article 151 of the Treaty of Maastricht of 1992 [Gordon, 2008:3]. This article is a fundamental milestone on the communitarian construction process, since culture acquires a new higher importance on the policies of the

Union. This article affirms that the Union should "contribute to the flowering of the cultures of the Member States, while respecting their national and regional diversity and at the same time bringing the common cultural heritage to the fore", recognizing the essential specific value of culture on the European integration process. The main general aims of the communitarian cultural policy are clearly determined on the Treaty of Maastricht, because it states that the Union should contribute to the flourishing of the cultures of the Member States, respecting and promoting national and regional diversity and pluralism, as well as stimulating the relevance of the common European cultural heritage. There are, however, other aspects that should be covered by communitarian political practice, such as the diffusion and better knowledge of cultures and history of the peoples of Europe, the conservation and protection of the heritage, non-commercial cultural exchanges and the support of the artistic and literary creation, including the audiovisual sector. But one of the most important affirmations of the Treaty is the need of the reinforcement of the cooperation among the Member States, as well as with third countries and international organisations with cultural competences, especially with the Council of Europe. Anyway, since the incorporation of culture to the European political panorama, there is no other further explicit mention on the subsequent treaties of Amsterdam and Nice. Nevertheless, posterior resolutions and decisions of communitarian institutions have adapted the general cultural objectives to the new tendencies, adopting a more modern point of view of the European cultural policies. Among those documents, there are some of greater significance than the rest.

The first one is the document that reflects the conclusions of the Council of the 10th of November of 1994 about a communication called *European Community action in support for culture* [94/C 348/01]. The Council advocates for the cooperation between the Commission and the Member States to reach a better functioning of the principles of subsidiarity and complementarity. It also aspires to propel a greater attention to the audiovisual sector, mainly to aspects related to the cultural dimension of the means, and defends the support to networks for cultural and artistic projects that foster a better innovation and dialogue.

The second important resolution of the Council was related to culture and the multimedia of the 4th of April of 1995 [95/C 247/01]. The communitarian institutions affirm that the irruption of the Information Society can widen opportunities for citizens to access information itself. Being so, the Council defends that cultural richness and diversity can be

accessible to new publics and the Union should be aware of the opportunities presented by the multimedia.

One of the last important resolutions related to culture dates from 25th of July of 1996 [96/C 242/01] and deals about access to culture. The document declares that full participation of citizens on society is in direct relation with active and passive access to the cultural life. Since the apparition of the resolution, the Union tries to reinforce equity of opportunities to access cultural activities of the whole citizenship, because, along with participation in social life, it will create a clearer sense of belonging to a greater community.

Significantly more recent is a resolution of the Council concerning a *European Agenda for Culture* [2007/C 287/01] on the 16th of November of 2007. After having highlighted that culture is evidently closely linked to social development, the document adds to the traditional assessments about the promotion of cultural diversity and the importance of the intercultural dialogue another one more adapted to the current socio-technological panorama. This point defines the promotion of culture as a driving force for the creativity within the framework of the Strategy of Lisbon for the Growth, the Employment, the Innovation and the Competitiveness. So, this resolution clearly states that creativity, innovation and culture present an internal link for the social and economic development. This document can, consequently, be interpreted as an obvious effort of communitarian institutions to adopt general cultural purposes to the current social situation.

As can be seen, beginning from a very general concept of cultural policies, the European Union has reached a more specific one that takes into account their potential use to create a greater social coherence, human development of the peoples and a stronger feeling of European citizenship, through culture and education. Similarly, the introduction of new technologies to cultural policies has been an event of capital importance, because the Union has remarked that they are really useful tools to create links and networks among citizens and, thus, reinforce the common sense of belonging. This developing vision of cultural policies is also the reflection of continuously changing ideas of policy principles and surrounding social circumstances [Gordon, 2008:17].

All these specific principles, anyhow, are guided by some more general cultural perceptions and objectives of the European Union. This political construction is a multicultural space,

where numerous different cultures exist together, but not only great national ones, but also small, regional or local ones. Besides, the states of the European Union are rarely culturally homogeneous, because most of the times they embrace different cultural groups and communities. That is why the European Union wants to ensure a harmonic coexistence of different cultural groups, by preserving cultural pluralism through the perspective of the cultural relativism that adapts to the changing scenarios [Appadurai and Stenou, 2000:111].

On the other hand, the European Union tries to create a unified identity for the Europeans, which can be considered as its most ambitious aim. The challenge is to preserve cultural pluralism, but, at the same time, create a shared common identity [Meinhof and Triandafyllidou, 2006:3; Sassatelli, 2006:29]. Fostering a new identity to replace the old national ones would not foster the process of integration of the member states of the European Union. A common past is the simplest way of reaching a sense of collective belonging and this is the reason culture to be so strategically important when reinforcing the process of a new identity. There is, thus, an apparent contradiction on the European cultural policies. As declared on the main objectives, they aspire to preserve national and regional diversity, as well as to impel a better knowledge and diffusion of the culture and history of the European peoples. So, most of the official documents referring to culture in the European Union highlight its multicultural reality. Communitarian institutions are aware of the richness of diversity of European culture itself, but they are also aware of the risks of any artificial attempt to create a new common homogeneous identity. Thus, European cultural policies have some very specific characteristics. They do not only look for protection and preservation of culture per se, but as a way of reinforcing a communitarian sentiment. This fact should stimulate a multicultural space, where cultural intercommunication represents a highly important role. Communitarian cultural policies have created certain specific action lines to achieve a higher degree of union among different citizens of diverse European states. The obtaining of communitarian funds, so, requires the representation of cultural agents from more than one state, trying to foster and reinforce a dynamic of creation cultural networks that reflect cultural diversity and specificity of their participants. Moreover, these networks should attract a higher degree of civic participation on cultural action and diffusion processes. This trend is an incentive for a more democratic participation of citizens on cultural processes and, consequently, a closer culture to individuals. European cultural policies, logically, follow a cultural planning trend similar to cultural democracy, where apart from supporting cultural excellence,

communitarian institutions foster a continuous and vigorous artistic recreation for the citizens of different cultural realities. Apart from that, European institutions search a more decentralized cultural activity to ensure equal opportunities of access to culture for the whole European citizens. It is not a process of creating new cultural centres, but of exploiting the capacities and opportunities of the currently existing ones. This process is completely logical, since any territorial disequilibrium, can hinder the project of creation of a shared sentiment of belonging. Summarizing, in order to create a stronger feeling of communitarian belonging, the European Union supports a cultural policy that reinforces civic participation and representation of cultural diversity. This does not imply that artistic geniality is not fostered, because there are certain means to support its promotion. Anyway, it can be said that central ideas of European cultural policies are the application of cultural democracy and a more decentralized cultural organisation, namely the promotion of participation and the support for the creation of cultural networks [Sassatelli, 2006:30].

Even though these principles are the guiding lines of the continuous cultural planning of the European Union, the material application of communitarian cultural policies does not present a linear continuity, but diverse phases with different characteristics can be perceived. So, the temporal interval could be divided into four differentiated periods: the formation and education one, the opening to the Information Society, the integrating programmes and, finally, the creativity and innovation phase.

The formation and education phase (1974-1994) is the one in which most of the actions and programmes were designed by the General Directorate of Education and Culture in order to support education and formation of the Europeans. It was the period in which the European Communities published programmes, such as *Lingua* [89/489/EEC], *Erasmus* [87/327/EEC], *Eurydice* [90/C 329/08] and so on. But on this phase there are not only programmes about education and formation, since other ones regarding new technologies (*Eurotecnet* [89/657/EEC]), the audiovisual sector (*Media* [90/685/EEC]) and other punctual and specific resolutions, recommendations and communications about traditional aspects of culture (theatre, cinema, literature, arts and cultural and natural heritage) were published. Obviously, many non-strictly cultural initiatives had a profound impact on culture itself [Obuljen, 2005:11]. Among all the documents of this period, the most important one, taking into account its duration, was the one of 13th of June of 1985 creating the European Capital of Culture [85/C 153/02].

The following phase was the opening of the Information Society (1994-2000). During this period, apart from the reinforcement of programmes of education and formation, the European Union introduced the vital importance of the multimedia and the new technologies in order to reach its objectives. This new phase took place during the period in which the Information Society was being established at an international level. This is the reason for many European programmes to be addressed to the research, creation and development of new technologies to help on the process of European integration. Among the many programmes, there are three of special importance. The first one is the *MLIS Programme* [96/664/EC] for the promotion of the linguistic diversity on the European Information Society. The second programme was known as *Info2000* [96/339/EC], which looked for the favouring of the demand and use of multimedia contents, creating the optimal conditions for the development of a European industry of the multimedia contents and contributing to the professional, social and cultural development of the European citizens. The last programme, on the other hand, was *Media 2* [95/564/EC] that supported the European audiovisual sector.

The third cultural policies period of the European Union can be considered as the integrating programmes one (2000-2006). During this phase, the European Union continues creating punctual programmes for some specific issues, such as *Leonardo 2* [COM (1998) 330 final] or *Socrates 2* [253/2000/EC] for the education or *Interreg 3* [2000/C 143/08] for the interregional cooperation. Anyway, the principle characteristic of this period is the publication of some programmes of a special relevance that try to bridge some commonly separated ambits of action. Despite of the development of all these initiatives, the European cultural policy can still be considered protective with the previous status quo of the cultural sector, instead of an adaptive one to the new reality [Obuljen, 2005:12]. The following analysis will take into account three of these programmes and a communication by the Commission because of their global impact and importance.

The first integrating programme is *Culture 2000* [508/2000/EC] on the proper area of culture. This programme aims at integrating the previously separated aspects about artistic activities, literature and cultural heritage. That is why one of the most relevant aspects of Culture 2000 is the concentration of the previous *Kaleidoscope* [719/96/EC], *Ariane* [2085/97/EC] and *Raphael* [228/97/EC] programmes. The main goal of this programme is

to contribute to the promotion of a common cultural area that will lead to a greater cooperation among artists, cultural operators, cultural institutions and European citizens. This general programme concentrates most of the more traditional aspects of culture and its production in order to create a greater coherence among them. Besides, this programme has a clear continuation on the further *Culture Programme (2007-2013)* [1855/2006/EC], which will provide a framework for action for all traditional cultural agents.

Related to the audiovisual sector, the creation of *Media-Training* [163/2001/EC] and *Media+* [2000/821/EC] was crucial on the cultural political panorama, since these two programmes aim at contributing to the formation of the professionals of the industry of the audiovisual programs, as well as the development, distribution and promotion of audiovisual works, spreading new forms of audiovisual contents based on the new technologies.

Finally, the *Framework Programme 6* [1513/2002/EC] set up the basis for further programmes, not only on the cultural sector, but globally. It was probably the most important and ambitious programme of this phase. It contains numerous sections concerning culture and European society, but all these sections are related to a more innovative perception of culture, totally connected with the Information Society and the development of new technologies. This programme remarked two main objectives, namely the reinforcement of scientific and technological basis and the promotion of research activities that support communitarian European policies. To reach these objectives, the communitarian institutions promote the creation and reinforcement of the European Research Area that will be an important part to create a feeling of shared belonging and to reach a higher level of social coherence and cohesion. All this ideas and achievements will continue in force under the umbrella of the *Framework Programme 7* [1982/2006/EC], which runs until 2013.

On the other hand, the Commission, after having seen the success of the programmes, published a communication called *Making citizenship work: fostering European culture and diversity through programmes for Youth, Culture, Audiovisual and Civic Participation* [COM (2004) 154 final], which aspires to put the basis for further political actions of the communitarian institutions. This document is vital to understand the future scenario that the Commission aims at creating for culture, since it highlights the necessity of taking care of culture and diversity. For the first time, the Commission declares that European identity is still

developing and has to complement the ones that the citizens previously have, being them national, regional, ethnic or religious, among others. The document affirms that fostering mobility of the citizens and artistic works will help European peoples to find common elements and values. So, it is clear that for the development of a dynamic European identity the Commission adopts a bottom-up perspective, which defends that no institutions will create the identity for the Europeans, but the individuals themselves will form it by means of the interaction of citizens of different places of Europe. The added value of these actions resides on the cooperation and the creation of links and networks among the European citizens, since cooperation means a better understanding and comprehension of the peoples of Europe and, consequently, a reinforcement of a common shared feeling of belonging. Finally, the document declares that it is necessary that communitarian institutions get closer to citizens, because the closer they are, the bigger the degree of participation of the citizens on them. The Commission is, moreover, aware that participating and accepting responsibilities at any political level represents a process of progressive identification with the institutions and, consequently, a better development of a sense of civic responsibility towards the community.

The creativity and innovation phase (2003-present) is chronologically the most recent one, even though its starting point can be set some years earlier. Moreover, the beginning of this phase overlaps with the previous once, since, in fact, the Lisbon strategy that aimed at propelling competitiveness and innovation in the European society was published on 2000 and reformed on 2003. After the reform, this strategy became a central point for any policy planning of the European Union, reflecting its importance on the working paper *Choosing to grow: Knowledge, innovation and jobs in a cohesive society* [COM(2003) 5 final/2] of the Commission. The main aim of this strategy was to become the European Union the most competitive and dynamic knowledge-based worldwide economy by 2010 and, consequently, aspires to better support and impel an optimal development of the Knowledge Society on the European Union. More specifically, this political strategy is structured around three central ideas that defend that innovation should be the driving force of the economic and social development, that economy should be oriented towards learning and knowledge as main processes and resources and, finally, that there has to be a social renewal, avoiding any kind of exclusion. All these guiding lines have leaded the European society to a leading position on the knowledge market, but, although a notable progress on the results has been identified, there has been a remodelling on 2010,

publishing the strategy *EU 2020* [COM (2010) 2020]. After facing an important crisis, communitarian institutions have definitely bet for innovation as the driving force of the economic and social development of Europe. Thus, the previous Lisbon targets are completed with the inclusion of a new one that advocates for an intelligent, sustainable and integrating growth of the European economy. So, knowledge and innovation will help to achieve a higher degree of social cohesion and a stronger and more sustainable economy. In this manner, the European Union has clearly chosen to adopt a model mainly based on innovation to develop both its economy and society. Logically, according to this new perspective on development, the cultural political actions and planning of the communitarian institutions have derived to a more innovation-oriented trend.

Anyway, there are some initiatives and programmes that clearly continue with the trend of the previous period. On the one hand, the Council adopted a *Work Plan for Culture 2008-2010* [2008/C 143/06]. The priorities of this document deal with the mobility of citizens and artworks, the creation of synergies between culture and education, the preservation of the cultural heritage, the intercultural dialogue, the access to culture of the citizens, as well as the digitisation of European contents. Closely related, there is another programme, published at the end of 2006, denominated *Europe for Citizens (2007-2013)* [1904/2006/EC]. This programme's objective is to create a more active citizenship and reinforce the European common identity. As can be seen, these two initiatives are closely related to the traditional objectives of the European Union.

European cultural policies, however, present two recent very important ambits of action that will be subsequently explained more in detail. These two fields of work are specifically related to the development of technologies and their application for a better and more sustainable cultural sector. **On the one hand, the European Union supports decidedly that innovation has to play a key role on the development of the cultural field. On the other, communitarian institutions are also really aware of the necessity of ensuring an egalitarian access of all the members of the society to the new cultural spheres**. In other words, European cultural policies are strongly supporting both policies for the innovation on the cultural sector, as well as for an efficient eInclusion of the citizens.

As have been explained on earlier sections, innovation is assimilable to change [Fagerberg, 2003:16] and means just a new way of combining existing resources and knowledge [Fagerberg, 2003:19] to obtain new or original goods, services or even processes. Current processes of innovation are labelled as Second Generation Innovation Policies [European Commission, 2002a:10]. These policies emphasize innovation in systems and infrastructures and, consequently, innovation is centred on the material realm. Nowadays, however, some institutional instances are aware of a continuously growing need for the implementation of a Third Generation Innovation Policy that will put innovation in the centre of all policy areas by removing boundaries between various ambits of political action [European Commission, 2002b:2008]. In this sense, the purpose of the European policies is clear and can be defined as the stimulation and encouraging of the creativity for the social and economic renewal [KEA, 2009b:9; European Commission, 2002b:8; Kainulainen, 2010:26]. That is to say, European innovation policies aim at better achieving the Lisbon Strategy principles published on 2000. All the innovative processes should not be merely addressed to the material innovation of the resources, but to add value to innovation through the redefinition of the established boundaries of the market [Kim and Mauborgne, 2005]. Or in other words, innovation should not simply impel the material side, but also the intangible one of the processes and structures. Moreover, innovative processes, in order to get economic influence, have to get disseminated [Fagerberg, 2003:18]. For this reason, the European spheres are conscious of the necessity of creating incentives and policies to reward value innovative behaviour [Kim and Mauborgne, 2005]. From the various scenarios possible for the future, the European Union has officially adopted the model of Competitive Europe to be implemented [Ringland, 2004:15, 36]. This model supports positive attitudes towards technology that will foster further economic growth and development. Besides, in general terms, European institutions are really concerned about issues regarding distribution of innovative products, services or processes, but above all about security, standards to share contents and their preservation. Arising from this general framework, the European institutions have published and adopted some programmes and declarations related to innovation.

One of the most important political initiatives has been the publication of the *Framework Programme for the Innovation and Competitiveness* [1639/2006/EC]. This programme aims at fostering innovation and competitiveness on different ambits and, logically, also on the cultural realm. Concerning ICT, this framework supports other minor initiatives, such as

eTen [2236/1995/EC] for the pan-European diffusion of technological services and applications, *eContent* [2001/48/EC] and *eContentPlus* [456/2005/EC] for the development of innovative European digital contents and *MODINIS* [2256/2003/EC] to support actions for the evaluation, research or sharing of good practices about the optimal application of eEurope activities. This Framework Programme regulates financial and support instruments for the coordination of all these aims.

The *i2010 – European Information Society for growth and employment* strategic framework [COM (2005) 229 final], on the other hand, intends to foster the Information Society in Europe through the completion of a Single European Information Space, the strengthening of innovation and investment in ICT research for the promotion of economic and social growth and, finally, achieving an inclusive European Information Society. The faster, more innovative and competitive broadband services have to support the creation and circulation of European content and knowledge. This will be secured through investment in ICT research and development. But all these premises have to be reflected on non-elitist but completely inclusive services and structures.

The European Parliament and the Council, moreover, adopted on 16 December of 2008 a decision appointing 2009 as the *European Year of Creativity and Innovation* [1350/2008/EC]. This declaration wants to strengthen the capacity of Europe for creativity and innovation in order to respond more effectively in economic and social terms to the full development of the current Knowledge Society structures. It aims at raising public awareness, promoting research and policy debate and disseminating information about good practices. It remarks the importance of lifelong learning, as well as of cultural diversity. However, the decision is nothing else than the mere expression or declaration of good intentions.

One of the final big communitarian initiatives in terms of innovation is the *Digital Agenda for Europe* [COM (2010) 245], adopted in 2010. It aims at delivering sustainable economic and social benefits from a digital single market based on fast internet and interoperable applications. It looks for the maximization of the social and economic potential of ICT. It can be considered as the continuation of the *i2010* initiative for a single digital market, investment in ICT and the enhancement of digital literacy, skills and inclusion from 2010 on.

Nevertheless, the most relevant document directly related to culture and innovation for this work is not strictly a political initiative, but a report on the impact and possible consequences of the new technologies in the cultural sector and more precisely the cultural heritage sponsored by the Directorate-General for the Information Society of the European Commission. This report, called *The DigiCult report – Technological landscapes for tomorrow's cultural economy. Unlocking the value of cultural heritage* [European Commission, 2002a], centres its attention on the so-called memory institutions, namely archives, libraries and museums. All these cultural institutions, as clear containers of inherited contents from the past and the present, face the challenge of adapting themselves to the new technological juncture. In addition to recommendations to regional, national and international instances, the document remarks four challenges for cultural institutions: fully develop competences to perform better with digital contents; cooperate at all levels to reduce risks and avoid market failure and waste of resources; exploit their own strengths and core competences; and become methodical regarding the digitisation programmes. **All these challenges require an organisational change to reinforce new processes on the management and preservation of cultural heritage in its digital form**. The institutions will adopt a hybrid form between the material and virtual spheres to cope with all the previous challenges, because material contents will have to become digital to survive in the new socio-technological juncture together with the born-digital resources. This document, however, assimilates in a great degree innovation with digitisation procedures, simplifying the meaning of the whole innovative processes.

Generally speaking, it can be said that the European Union has made a clear choice for the innovation [European Commission, 2003b] and is reflecting the importance on the policy instruments and initiatives. Anyway, the actions and programmes related to innovation deal with diverse areas, but mainly with market and industry processes. The cultural notion, on the contrary, is very closely related to the digitisation processes of cultural contents, leaving more advanced technological innovations out of the traditional support of cultural policies. These kinds of innovations, consequently, have to be developed, implemented and tested under the umbrella of other most directly cultural-oriented actions and initiatives.

Similarly, the inclusion of all the citizens into the cultural processes is one of the main objectives of the communitarian institutions, under the framework of the policies for the eInclusion. National and international institutions are aware of the fact

that, in order to legitimate their existence, it is essential to become as many individuals as possible part of their social structures and frameworks. This is one of the main reasons for institutions to foster inclusion actions and initiatives. It is not the only one, however, since the inclusion of a broader spectrum of citizens into the existing social structures is not only a must, but another step on the economic development of the society [European Commission, 2007b:7; Codagnone (ed.), 2009:5]. The greater the deprived part of the society, the bigger the handicap for the economic and social development. In fact, it is argued that inclusion and the degree of innovation of societies evolve together in a high degree [Codagnone (ed.), 2009:5]. Even though when the term was coined in 1972 in France it had a purely economic sense, nowadays social exclusion expresses a more comprehensive idea of economic, social and cultural processes. Evidently, from this broader perspective, the benefits of the social inclusion will not be merely economic, because it embraces also non-economical ones [Codagnone (ed.), 2009:7; European Commission, 2007b:7; Helsper, 2008:10].

Even more, it has become quite clear that economic and social development have to evolve jointly. Actually, since the publication of the Lisbon Strategy, it has been clear that growth has to go together with the preservation of the current social model of the European Union [Codagnone (ed.), 2009:5]. Or in other words, social inclusion does not only mean physical and material access to the resources and structures, but of participating in their processes [Codagnone (ed.), 2009:5-6]. More precisely, social inclusion depends on social participation, which can be defined as a conscientious, rational and organized activity to defend own and shared interests, to reach social, economic and political development and to influence, being it directly or indirectly, on the decision making process to improve the quality of life of the citizens [Agustín Lacruz and Clavero Galofré, 2009:149].

On the current technological juncture, inclusion has to deal with a clear technological perspective, denominated **eInclusion**. Logically, the ultimate objective of the eInclusion policies, as well as of any inclusion policy, more than just a mere technological insertion, has to be to improve life chances [European Commission, 2007b:8; Agustín Lacruz and Clavero Galofré, 2009:149; UK online centres, 2008:48] and, consequently, all these political actions support initiatives for individuals to achieve important benefits adding up social outcomes [Codagnone (ed.), 2009:6; European Commission, 2007b:7; Helsper,

2008:25]. Thus, all the inclusion policies seek social outcomes more than simply economic ones.

As already mentioned, the irruption of technologies in daily life activities is changing social structures and so, technologies can support inclusion processes, but also mean a challenge [Codagnone (ed.), 2009:7, 14, 45]. The exclusion of the technological circuits or Digital Divide generates inequalities in both economic and social terms [Agustín Lacruz and Clavero Galofré, 2009:145-146; Helsper, 2008:9]. This relation works in both directions, since the more deprived economic and socially an individual or a group is, the more digitally deprived they will become. In fact, there are many factors that can explain inclusion and exclusion processes, mostly social and economic ones [Codagnone (ed.), 2009; Helsper, 2008:12]. In order to minimize the impact of all the disadvantage factors, the current view puts great emphasis on the access to technologies for all the citizens [Helsper, 2008:23]. Most of the initiatives and plans, however, deal with the simple access to ICT, while inclusion means appropriating of technological applications to the daily practices of the individuals [Codagnone (ed.), 2009:12]. Inclusion plans on the technological panorama, thus, do not only have to ensure access to technologies, but also to help individuals to make use of the full potential of the application to improve their performance on daily life activities. Consequently, digital management is more than just technology access, since it involves the appropriation of cultural, social and attitudinal factors [Helsper, 2008:15, 24; European Commission, 2007b:7]. Digital engagement is a complete process, in which access to technologies represents only the first stage.

Being a so complex process, inclusion can be analysed from a twofold perspective, the cognitive proficiency one and the social proficiency [UK online centres, 2008:48]. The cognitive proficiency process resides on the appropriation of knowledge by individuals that will increase their human capital. Social proficiency, on the other hand, will provide individuals with the necessary skills to better perform on the social processes. That is to say, social proficiency will add value to the social capital of individuals and groups. Every individual, depending on the needs, will have to reinforce the most suitable perspective, but institutions, on their willingness to better the inclusion of every one, have to consciously reaffirm both of them by different measures. This is not the only way of analysing the different political actions, because there are different theoretical models of dealing with inclusion. The most optimistic one is the S-shaped innovation curve [Codagnone (ed.),

2009:9] that argues that differences on the inclusion processes regarding technologies are related to their early or late adoption. According to this model, as users advance on the curve, their eInclusion degree will increase.

On the other hand, the Differentiation View defends that inequalities will never disappear [Codagnone (ed.), 2009:10]. Indeed, once the access to technologies has been ensured for all individuals, new disparities will arise on the use of these tools for daily life activities. Actually, different levels or even stages of social engagement can be identified on the eInclusion processes [Helsper, 2008:11]. At a very initial basic stage, the individual will delimit actions to simple information seeking, communication, learning or buying.

At a more advanced intermediate level, on the other hand, previous activities will join new ones, such as gaming, individual networking or finance issues. Finally, the most advanced user will increase the previous activities with other more social ones as civic engagement through technologies or social networking. As can be seen, digital inclusion is a continuous process that requires the active participation of the individuals. Moreover, it is a dynamic process that evolves jointly with technologies [Helsper, 2008:28]. From the previous mere information or commercial forms of engagement, digital inclusion has evolved to communication, entertainment and participatory ones.

Before concluding, there is another issue that is crucial to bear in mind when analysing eInclusion, although political institutions do not seem to be aware of it. Not all individuals that are digitally disconnected suffer deprivation or a lack of skills to be fully part of the digital environment. In fact, individuals can also adopt the so-called 'digital choice' [Helsper, 2008:10-11, 40]. This choice involves a conscious option of not getting into the technological circuits and processes, not because of not being able to, but of a lack of willingness. This option, obviously, has to be respected and not try to force these individuals to get inserted into the structures. That is why political institutions should differentiate on their political planning between the consciously disconnected ones and the deprived, unskilled excluded ones.

There is no need to say that, evidently, European institutions are completely conscious of the importance of adopting an approach that fosters inclusion processes for all the individuals on the Union. Overall, the eInclusion policy of the European Union can be

divided into six thematic areas, namely eAccessibility, Ageing, eCompetences, socio-cultural eInclusion, geographical eInclusion and inclusive eGovernment. Anyhow, the general objective of all these areas is the inclusion of all citizens in the current technological processes. In this sense, although political programmes are not plenty on inclusion initiatives, recently there has been a multiplication of institutional documents and statements. Actually, apart from collateral actions in some support and funding programmes, most of the references to the inclusion arise from institutional communications and declarations.

The first milestone on the eInclusion policy development is the *Riga Ministerial Declaration on eInclusion* of 11th of June of 2006 [European Council, 2007]. After highlighting the importance in growth terms of ICT, as well as in social ones, the declaration remarks the resilient gaps in use among many Europeans. Being just an institutional declaration, the document stresses the need to reinforce the thematic general areas. It aims at ensuring the eAccessibility to all citizens, by fostering measures of usability of the electronic communication and technologies. Other of the objectives of the declaration is to impel the reduction of age and geographical gaps between the individuals. In cultural terms, this declaration emphasizes the need to improve digital literacy and competences, at the same time of promoting cultural diversity in relation to inclusion. Due to their lack of competences to publish and adopt effective initiatives, however, the European Council invites the European Commission and other authorities to advance in the process of deepening in the implementation of the goals of the eInclusion policies.

Attending to the previous declaration and to the actual situation, the Commission published the 8th of November of 2009 a communication called *European i2010 initiative on eInclusion – To be part of the information society* [COM (2007) 694 final]. One of the first remarks of this document affirms that persistent digital divides affect negatively to cohesion and prosperity. Conscious of this fact, the communication wants to enable the conditions to take active part in the current information society. In order to improve the skills of citizens and bridge potential gaps, the document urges public authorities to better coordinate effective policies for the eInclusion. It is also important, according to the approved text, to understand the deep roots of the inclusive processes, as well as to compare the progress to achieve the objectives in different levels.

Closely related to the preceding document, a year later the Commission published another communication denominated *Towards an accessible information society – Status and challenges of eAccessibility in Europe* [SEC (2008) 2916]. Unlike the previous statements, this document centres its attention on the eAccessibility of the technological applications. Once the access to the technologies is ensured, the next step is to make sure that the applications and contents are available to everyone, with no regards to any external factor. In order to evaluate the accessibility of the technological applications, moreover, the document proposes a unified model that should be verified at different stages.

Finally, the previously explained *Digital Agenda for Europe* also contemplates an inclusion perspective. Having defended the need of a digital single market and the benefits of fast and interoperable technological applications, the document highlights and reaffirms that a must of the institutions should be to provide equal access to technologies for all individuals. So, this agenda strongly supports initiatives addressed at achieving an inclusive dimension of all the European actions.

Consequently, as can be deduced from the previous analysis, European institutions are really aware of the challenges that the current socioeconomic juncture has created. They are trying to readapt to the new situation without having to refuse to their philosophical grounding principles. Logically, innovation and creativity play a crucial role in all the political planning, but every initiative is based on the inclusive principle for all the citizens.

The European Union, aware of the importance of the cultural legitimization of the ongoing integration process, has been systematically regulating cultural policies since the adoption of the article 151 of the Treaty of Maastricht in 1992. Although at the very beginning punctual actions were the implemented tools, the European cultural policy has evolved to become more embracing and to reflect the increasing complexity of the cultural sector. In this sense, the current phase of the communitarian cultural policy is greatly driven by an increasing support to technological implementation, creativity and innovation in the cultural sector. This adaptive character of the European project is reflected on the different documents for the implementation of planning and regulation tools.

2.3.- Brief summary of the background of the research

Before advancing to the object of study of the research, it is worth briefly remarking the main characteristics of the current juncture explained on the previous two background parts of this section.

The massive implementation of technologies has broadened the reach and instantaneity of the access to digital contents. This phenomenon reinforces the possibility of a social and cultural paradigm change. The new Social Media tools have turned communication into an interactive dialogue, enabling substantial changes to organizational management and individual participation.

In this original socio-technological juncture, moreover, culture can be labelled as a set of values, ideas, beliefs and symbols, as well as a productive and reproductive process. At present, culture can be understood as a means of creative industries, highly innovation-driven and with a growing importance in national and regional economies.

This productive and industrial change, along with the generalized digitisation process of cultural contents, implies a challenge for institutions and policy makers. The cultural strategic planning and design has to adopt the increasing technological and digital environment. Within this new situation, cultural institutions, governments and regional administrations are called to move forward on their approaches to cultural policy.

2.4.- Museums in the Knowledge Society

Traditionally, great part of cultural expressions have been contained and displayed in museums, perceived as cultural containers. Since their appearance in the Ancient Greece, the notion and definition of museums as institutions of the memory has changed considerably, together with the collecting processes. In fact, the most obvious evolvement has taken place in relation with the communication paradigm and the educational role of the museums. Recently, moreover, development in museums' domain has been backed by the implementation of technologies and, more specifically, of web technologies to deliver and communicate contents to their audiences. These new web technologies have had a profound and irreversible impact not only on the communication of contents of museums, but also on their overall management structures. The proliferation of websites of museums has facilitated the access of users to the contents of the institution and their behaviour in these environments has to be taken into account at the time of implementing technologies. Bearing in mind the objectives of the research, this section looks at the topic of museums in the current Knowledge Society from a twofold perspective. On the one hand, it will deal with the communication philosophy of the museums when implementing web technologies and, on the other, with the behaviour of users when accessing the digital resources of the institutions.

2.4.1.- Definition of museums

Museums have been and still are the institution where people collect, conserve and display their memories and references of the past. As such, there is a clear identification between museums and the heritage of the peoples, even since the periods were the writing was non-existent. And so, museums can be identified as the reflection of the collective memory of

the peoples, which aims at being communicated and spread among individuals. That is why museums are the object of study of the present research. Anyway, their definition as institution is not completely clear-cut and reflects the long and rich history they have. Consequently, this section deals with the different approaches to the definition of museums by different political institutions and finally adopts one of them as operative definition for the research.

Since the Ancient Ages, museums have collected and displayed the memory of the peoples they represent, but their function and even their own perception have evolved according to the social and historical context they were living. That is why there is a huge amount of definitions of museums as institution.

Still today, there are some slight discrepancies among academics and political agents about the exact definition. This is the reason for the existence of a faint indefinition among countries when clearly delimiting museums as an institution. There are even countries with no official legal definition of museums. For instance, Germany, related to its federal configuration, does not have a unified official definition of what a museum is and they generally use the one provided by the International Council of Museums to refer to them. Neither Greece has adopted another official definition about museums, apart from the translation of the one provided by the ICOM. Anyhow, the most common trend is that every country adapts that framework definition to its own situation or perception, making definitions vary slightly. As an example, there can be seen different definitions.

Canadian Museums Association states that "museums are institutions created in the public interest. They engage their visitors, foster deeper understanding and promote the enjoyment and sharing of authentic cultural and natural heritage. Museums acquire, preserve, research, interpret and exhibit the tangible and intangible evidence of society and nature. As educational institutions, museums provide a physical forum for critical inquiry and investigation.

Museums are permanent, not-for-profit institutions whose exhibits are regularly open to the general public"[19].

[19] Canadian Museums Association: http://25538.vws.magma.ca/en/info_resources/reports_guidelines/museum_definition/index.php (Last accessed 2009-11-17).

Australia, on the other hand, defines on his Museums Australia Constitution of 2002 that a museum is an institution that "helps people understand the world by using objects and ideas to interpret the past and present and explore the future. A museum preserves and researches collections, and makes objects and information accessible in actual and virtual environments. Museums are established in the public interest as permanent, not-for-profit organisations that contribute long-term value to communities"[20].

The Ministry of Culture of Spain, in turn, formulated another completely different definition of museums; partly due to the fact that its Law on the Spanish Historical Heritage (16/1985) was elaborated many years before the one of International Council of Museums. This Law defines on its article 59.3 museums as follows. "Museums are institution of permanent nature that acquire, conserve, research, communicate and exhibit for study, education and contemplation purposes sets or collections of historical, artistic, scientific and technical value or of any other cultural nature"[21].

The American Association of Museums, as a section of the International Council of Museums in the United States, declares the following on its Code of Ethics for Museums. "Museums make their unique contribution to the public by collecting, preserving, and interpreting the things of this world. Historically, they have owned and used natural objects, living and nonliving, and all manner of human artifacts to advance knowledge and nourish the human spirit. Today, the range of their special interests reflects the scope of human vision. Their missions include collecting and preserving, as well as exhibiting and educating with materials not only owned but also borrowed and fabricated for these ends. Their numbers include both governmental and private museums of anthropology, art history and natural history, aquariums, arboreta, art centers, botanical gardens, children's museums, historic sites, nature centers, planetariums, science and technology centers, and zoos. The museum universe in the United States includes both collecting and noncollecting institutions. Although diverse in their missions, they have in common their nonprofit form of organisation and a commitment of service to the public. Their collections and/or the

[20] Museum Australia: http://www.museumsaustralia.org.au/site/page13.php (Last accessed 2009-11-17).

[21] Translated by the author from Ley 16/1985, de 25 de junio, del Patrimonio Histórico Español (BOE de 29 de junio de 1985). Original text is as follows: "Son museos las instituciones de carácter permanente que adquieren, conservan, investigan, comunican y exhiben para fines de estudio, educación y contemplación conjuntos y colecciones de valor histórico, artístico, científico y técnico o de cualquier otra naturaleza cultural" (artículo 59.3). Available at: http://www.mcu.es/patrimonio/docs/ley16-1985.pdf (Last accessed 2009-11-17).

objects they borrow or fabricate are the basis for research, exhibits, and programs that invite public participation"[22].

Finally, the Museum Association of the United Kingdom gives the following definition of museums. "Museums enable people to explore collections for inspiration, learning and enjoyment. They are institutions that collect, safeguard and make accessible artefacts and specimens, which they hold in trust for society"[23].

As can be seen, even if all the definitions deal with some common trends, there are slight differences among them, mainly because some of them (such as the American Association of Museums or the Canadian Museums Association) stress more the educational role of the institution, while others tend to represent them as places to conserve and spread the memory of the peoples (e.g. the Museum Association of the United Kingdom). However, in order to delimit and clarify the object of this study, the definition given by the International Council of Museums on its Statutes approved in Vienna (24 August 2007) will be the one taken into account. It states that "**a museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment**"[24]. This definition aims at comprising all the aspects and issues related to museums, despite of being quite general to embrace all the definitions given by the political and legal institutions of the different states.

Summing up, museums are institutions with a long tradition, but not a unified official definition. Although some countries do not have an official political definition, most of them adapt their vision of museums as institutions to their political frameworks. These definitions range from a conservative vision of spreaders of the memory of peoples to a more educational one. Countries with no official definition, as well as this research, adopt the definition approved by the International Council of Museums, which aims at comprising all the aspects related to museums.

[22] American Association of Museums' Code of Ethics: http://www.aam-us.org/museumresources/ethics/coe.cfm (Last accessed 2009-11-17).
[23] Museums Association: http://www.museumsassociation.org/ma/10934 (Last accessed 2009-11-17).
[24] ICOM Statutes: http://icom.museum/statutes.html (Last accessed 2009-11-17).

2.4.2.- Evolution of museums and their notion

Museums as institutions and their very perception by society have been transformed throughout history according to social and historical events. In fact, there is a huge difference between what a museum was initially and what is considered nowadays as such. This section outlines the evolution of museums, covering the Ancient times, the Middle Ages, the birth of modern museums during the Renaissance, their evolutionist period and their recent development.

The evolution of the museums as an institution goes hand by hand with the historical events. In this way, the first time in history the notion of museum appeared was during the ancient Greek and Roman times. At this very initial stage of evolution, museums (from the Ancient Greek *μουσεῖον*) were spaces consecrated and devoted to the Muses [Alexander, 1989:7]. As such, the Greek temples held many objects[25] of aesthetical, religious or magical valour as votive offerings. The Romans, on the other hand, went a step further and displayed the artworks (many of them were the booty of their conquests) in public places such as leisure, religious, political spaces (theatres, baths, temples, forums) or public gardens. Moreover, Roman patricians appropriated of artworks in order to achieve some social status by displaying them in their private properties, and thus creating an open expository space[26].

After the decadence of the Roman Empire, the notion of museum remained alive, but took a slightly different form. During the Middle Ages, as a consequence of the growing European political disorder, the religious institutions, monasteries, churches and cathedrals, began to take care of the artworks and venerate most of them as relics of Christ, the Virgin, the apostles or some saints. So, the Christian power milieus became guarantors of the artistic representations of the European culture [Alexander, 1989:8]. Those representations were later mainly embellished with silver, gold or jewels for a higher aesthetical experience that would link the viewer with the transcendent sphere. At the same time that the Crusades tried to take control of the Holy Places, the religious institutions began to collect oriental pieces and expand their collections to broader horizons. Besides, mediaeval lords, princes and kings began to collect their own private treasures, remaining only accessible to the ones chosen by them.

[25] Paintings, however, were located in different spaces, known as *πινακοθήκη* or pinakothiki.
[26] "In a sense he [the emperor Hadrian] created an open-air or outdoor museum" [Alexander, 1989:7].

However, the above mentioned kinds of collections should not be called strictly museums in the modern meaning of the word. The idea of museum as it is known currently began to be shaped during the Renaissance period. The Renaissance humanists had really keen interest in the classical ancient world and they started again to take a deeper look into the artworks of the Greek and Roman periods, recovering the classical models and archetypes, identified as "the product of a superior epoch" [Hooper-Greenhill, 1999:60]. But they did not merely recover the aesthetic and artistic spirit of the classical periods, but tried to overcome the superstitious and religious constraints and advance beyond into the search of a scientific method for the collection and display of cultural and natural objects [Alexander, 1989:8].

According to Hooper-Greenhill [1999], in this sixteenth-century context, new types of spaces arise in the realm of museums. The first one is the *gallery* (from the Italian *galleria*), a long side-lighted hall which contained paintings and sculptures and where visitors could wander surrounded by masterpieces. The second one is the *cabinet* (from the Italian *gabinetto*), a mainly square room which contained small artworks, artefacts or rarities. That is what after in the German influence area would be known as the *Wunderkammer* or the *chamber of the marvels*. Related to them, too, greatly in the Germanic influence area, past models evolved into new ways of presenting collections. Among them, the most prominent ones were the *Kunstkammer* and the *Schatzkammer*. The *Kunstkammer* or *chamber of art* was designed as an space where the 'completeness' of the world was collected and displayed according to the time's theories of interpretation of human knowledge and the surrounding world, which were mainly based on religious beliefs. On the other hand, the *Schatzkammer* or *chamber of the treasure* was the display of the personal collection of some king or prince of some top masterpieces and artworks for his personal pleasure and that would be only shared with some elected ones. Those *Schatzkammern* were the basis for the further national treasures.

Anyway, the first modern museum was not really founded until the establishment of the Medici Palace as such [Hooper-Greenhill, 1999:77]. The opening of this palace is considered the modern starting point in museums history, because it comprised all the former collections display practices jointly with new forms of patronage related not to the religious power in order to glorify God, but to the political economic power and aiming at

glorifying the patron's own name. The merger of all these aspects resulted in a new exhibition space, radically different to the former ones.

All the above mentioned forms of displaying collections coexisted together, but some of them achieved a greater importance than the others. In this sense, the gallery and the Medici-like museum covered nearly all the European panorama since the seventeenth century. Moreover, during this century the importance of the *Kunstkammer* considerably decreased in fact because European knowledge evolved and it was not possible for them to represent and reflect the 'completeness' of knowledge [Hein, 2002:186]. The new discoveries made European knowledge more complex and difficult to represent, and so the spaces aiming at representing it as a whole had to face harder challenges than even before. However, all the different expository spaces pursued a common aim that was "producing a 'cabinet', a model of 'universal nature made private'" [Hooper-Greenhill, 1999:78].

During the latest part of the same century, a new milestone took place in the development of museum's history. Some university museums opened their doors that time in many European cities (e.g., Basel 1671, Oxford 1677, and so on). The development process of public museums has been a really long and diverse one, but all of them started to shape their current form from the mid-eighteenth century on and many of them remained public up to nowadays. Beginning on the nineteenth century, a twofold evolution in the history of museums spread from the United Kingdom to other areas.

On the one hand, this was the period of multiplication of the discovery travels around the globe to try to better identify the world and its peoples. Many of those travels were financed by public authorities and one of their main objectives was to expand the British economic and political power networks [Owen, 2006:21]. Nevertheless, even if those travels were designed to support the acquisition and expansion of the British Empire, many of the travellers tend to collect all they could about indigenous peoples to describe them. This recollection of indigenous-barbarian evidences was made from an ethnographic-naturalistic point of view and its aim was to obtain a complete and accurate picture of the peoples of the world. In this process of fostering discovery travels that would help expanding the British Empire, many European collections, being them public or private, began to acquire exotic, indigenous artworks and expand their primary recollection area.

The second milestone, on the other hand, was the support of some late-century collectors (Lubbock, Pitt Rivers, and so on) to the evolutionist theories of Darwin. Though at a first sight it can seem to have no link to museums sphere, the appearance of the evolutionist theories rearrange many of the previous displaying methods, because collectors tend to use evidences to reaffirm their evolutionist statements. For them, a usual way of displaying was the comparison of ancient European pieces with contemporary ones of the 'savage peoples' and to show then the evolution until reaching their contemporary status of development (e.g. most of the times evolutionists displayed from the simplest tools to the most complex ones in linear order) [Owen, 2006:21]. As the previous discovery travels, this evolutionist perspective also fostered the acquisition and expansion of the British Empire, because they showed it as the zenith of the human development and defended the necessity of expanding this model to the whole world. In this sense, using the allegedly chronological evolutionary display, those collectors supported the liberal concept of the state, defending the slow evolution against the revolutions. In order to do it, their idea of education was to instruct everyone about their place in society and nature, reaffirming and highlighting the instructional role of museums.

These initial British trends expanded to the rest of the world gradually, mainly impelled by the great imperial powers. After this period, the link of museums and the national powers became clearer, overcoming in some sense the previous link with the patron. Nearly in the same period, in order to achieve the aim of instructing the society, museums became a place to learn, going a step further than the previous mere aesthetical leisure experience. The new learning places illiterate society through traditional ways of display (labels, catalogues and gallery teaching, among others), not only in the United Kingdom, but also in many colonialist developed countries [Hooper-Greenhill, 1994b:258]. As an example, another important point of interest was the opening of the Louvre Museum of Paris, which was established during the French Revolution and that became an important educational site in 1792. After this period, museums were considered as primary learning sites for the society and its members.

However, at the end of the nineteenth century and beginning of the twentieth, museum began to share their educational role with schools and, little by little, society began to change its rules and values, mostly based on the British Victorian model of society. Museums lost the monopoly of one of their most important spheres of action and became

places to store, collect and take care of emblematic or symbolic objects. This change, that could seem minimal, supposed another milestone on the development of museums, because as learning spaces they were identified with the whole society, but as exhibition space of emblematic objects it was now seen as a more high-class-oriented, close, elitist and specialized institution. In this process of becoming more specialized they became a place for learning mainly for school groups and for the delight of more elitist groups. They transformed a holistic approach to educational role of museums into "piecemeal arrangements" [Hooper-Greenhill 1994b:259].

As the 20th century went by and after the World Wars, points of view on culture changed and even if during mid-century the mainstream of thought was the 'cultural democratization' or the attempt to bring high culture closer to everybody, the socio-political events (e.g. May '68) fostered the 'cultural democracy'. According to this perspective, the main aim is not to bring high culture nearer to people, but to impel the participation of everyone on culture and its processes and, as a consequence, reinforce creativity and identity processes of the whole society. This new juncture also claimed for the dissociation of the political national institutional power spheres and the cultural realm, fostering a greater degree of freedom and creativity [Fernández Prado, 1991]. **This cultural democracy approach was also introduced in museums and learning gained again a bigger importance in museums' management**. But this approach needed to overcome the elitist idea of museum that was still alive among most social groups to become a reality. In order to foster a new more comprehensive image of museums, the managerial teams started to implement more appealing experiences for the whole society. So, during the last decades, museums have witnessed the creation, implantation and later multiplication of more novel communication experiences as discovery galleries or interactive exhibits. This fact has also implied **a change on the paradigm of museums as sites for learning, with a higher degree of participation of the visitors**. Another important aspect is that **museums are now perceived not only as educational sites, but also as recreational ones** [Kotler, 2001:418]. Visitors arrive there with an implicit will of learning new things, but not in a boring way. That is, museums are still at the crossroad of overcoming their traditional strict and elitist image and creating a new more dynamic and integrating one.

Finally, the last milestone for museums has been since the nineties, but mainly during more recent times, the appearance and consolidation of the Knowledge Society and the irruption of technologies in the cultural realm. This irruption implies important changes on the ways or processes of storage, conservation and preservation, but above all of diffusion and communication of cultural contents, becoming then theoretically more accessible to a broader public and ideally to the whole of society. In this context museums are trying to take advantage of the potential of the implementation of technological applications, creating their own websites, digital collections and even virtual museums.

Museums have evolved from their very initial notion of spaces of devotion for the Muses to more technologically enhanced recreational spaces for learning. Even if there is not a clearly defined point of beginning of the modern museums, many authors consider the Medici Palace as the first modern museum, because it combined most of the traditional principles with the humanistic renaissance perspectives. After, museums linked to national power institutions and, along with their educational mission, reinforce political notions of the different spheres. Once museums had to share their global educational role with schools and teaching institutions, their function remained as collecting, storing and preserving artworks, fact that fostered a more elitist image of them. After the middle of this century, recent trends are trying to overcome constraints between museums and all the social groups and are also implementing new technological applications to exploit their potential for collections and museums as a whole.

2.4.3.- The evolution of collecting

As have been seen on the previous section, the notion of museums has evolved according to historical and social events. The collecting process, similarly, is closely related to the figure of museums as guarantors of the past. Collecting processes have clearly evolved from initial mystic supranatural purposes to current more aesthetic and symbolic ones, having also reflected evolutionist and nationalistic principles. Therefore, this section describes a brief overview of the evolution of the collecting process along with the development of the notion of museums as institutions.

Museums would be nothing but empty spaces if they were not accompanied by processes of collecting. Since the very beginning, human beings have shown their interest in accumulating and collecting material things, since "our relationship with the material world of things is crucial to our lives because without them our lives could not happen, and collecting is a fundamentally significant aspect of this complex and fascinating relationship" [Pearce, 2003:3]. Material culture is perceived as the reflection of social interactions and, as such, its accumulation and preservation can be identified as an attempt to preserve also

part of our own existence or identities. Objects can be socially perceived from three different perspectives: a) as pieces of the physical world transformed into artefacts by social procedures; b) as signs and symbols that create categories mediated by the transmitted message; and c) as meanings that have concrete value according to some socio-economic rules of the society in which they take place [Pearce, 2003]. Related to these three perspectives, collected material objects also played different roles in society. The first of all, dealing with artefacts, is that those objects are the result of past stories and remained as witnesses until nowadays. If dealing with the signs and symbols, collected objects can be treated as classifying assets that establish an order on the surrounding environment. Finally, the value of the objects can be used by the owners to achieve a high social status, by their symbolic power or by the utilitarian economic potential of their pay-off. The interaction of these approaches varies during time and so, also the perception of the objects themselves.

There is a clear difference between the process of accumulating objects and the collecting one, because the collector has a clear rational purpose in mind when facing the collection of objects [Pearce, 2003]. That is why the history of collecting does not begin until collectors clearly specify their 'rational' methods or achieving some purposes. In this sense, the accumulation of objects in Ancient Greece or Rome for aesthetical experiences or in the Middle Ages to link with the supranatural power can be seen as a precedent of the more modern collecting trends, but not as the creation of a collection itself. During this period objects were chosen by their uniqueness or rarity; that is, only unequalled artworks, curious objects, 'evidences' of supranatural powers and so on were collected.

However, the establishment of the first modern museums can be identified as the initial milestone to talk about modern collecting processes [Hooper-Greenhill, 1999]. Although the collecting process still focused on the same objects as before, since the Renaissance the purpose of collections was really defined. The display of an enormous amount of artworks gave the owner a prestige and a status on the eyes of people, which was directly linked to some kind of legitimacy to rule over them. And so, collections acquired a clear political component of power legitimacy which would remain for a long time in the history of collecting.

Moreover, also since the beginning of the sixteenth century the scientific academic spheres tried to understand the surrounding world, beginning a previously unknown fever of

collecting and organisation of objects. During this period many cities acquired big amounts of artworks and objects that expected to explain the world and its completeness. From then on it was not only a matter of quality or rareness, but an attempt to represent and order the completeness of the world in all of its material and natural aspects. Every collected object was a representation of a piece of knowledge available for human beings and its accumulation and order emulated the holistic knowledge of the world. "Material must be observed and arranged in order to yield up its inherent knowledge, and important material must be preserved in order to continue to demonstrate the truths that are asserted. Collected material, in other worlds, stands at the heart of modernist knowledge, both as evidence of particular truths, and as demonstrating what constitutes evidence, itself the underpinning narrative upon which the other stories depend. Collections, therefore, do not merely demonstrate knowledge; they are knowledge" [Pearce, 2003:111].

As an evolution of the previous collecting perspective, around the eighteenth and nineteenth centuries, the classification of objects and their use to explain evolution and distinction was the central issue of collections. At this time the dichotomy between 'high' and 'low' culture emerged as a result of the scientific classificatory system of the objects [Owen, 2006:21]. But, moreover, a historicist point of view gained ground in the collecting process and collections began to be used again with political purposes. This time the aim was not only to gain status or legitimacy, because the owner was usually the state itself, but also to reflect that their state of situation was the zenith of the development. In other words, the display of collections in a comparing way tended to remark the superiority of their nation above others [Owen, 2006:21]. Their more sophisticated objects were the reflection of their superior status of development and that was an extremely good alibi to colonize new territories in order to 'instruct' the less developed peoples. In that sense, the collecting area was increased greatly, because, in order to proof these theories, collectors began to focus on exotic, non-European objects. On the other hand, this was also the epoch in which the nationalism arose and collections were used to remark not only their superiority above other countries, but also to reinforce their identity as a nation.

When the evolutionist theories lost importance, nationalism and the proud for national collections still remained as a key point in the collecting process. This was totally linked with the movement of the cultural democratization. So, collectors continued acquiring renowned artworks to bring them nearer to the public. When the cultural democracy

gained importance, however, the collection trends also started to change little by little, because for its ideologists the main issue was not to spread the so-called high culture, but to represent people's creativity. Acquiring and preserving renowned artworks was still valid, but it has to be combined with the representation of the whole society and its many parts. It is not only a matter of diversification, but also of representation of misrepresented or ignored groups. This includes not only a changing in the collecting process, but also in the theoretical approach to this process itself. "Notions of classification and relationship, including those where value judgments are implicit, seem to have been subverted in favour of idiosyncratic assemblage which has no point of reference beyond individual quirks of partiality" [Pearce, 2003:149].

Nowadays the collecting horizon is really diverse and, besides, there is a permanent debate on what to collect or not. The main purpose should be to represent as best as possible the society, but, taking into account the multiplication of cultural assets of the recent times, the selection process has to leave aside many objects that will never be represented for forthcoming generations. The most recent cultural representations have to be preserved upon clear representation and selection criteria, which make the collecting process of the institutions harder than ever before. Anyway, one fact to bear always in mind is that any collecting process will be necessarily incomplete because of the unapproachable nature of human culture. The main point is that the collecting agent has to have a clearly defined purpose and collecting philosophy. To achieve this purpose only some objects will be useful and valuable and others will go adrift subject to market logics, because "the selection process clearly lies at the heart of collecting" [Pearce, 2003:23].

Even though collecting has been present in the history of humankind since the very beginning, modern collecting processes began when museums started to follow rational methods to represent the memory of peoples. After the adoption of evolutionist and nationalist perspectives, current debates on the collecting processes are centred on representativeness and selection criteria to better reflect the diversity cultural and artistic expressions of society, due to the unembraceable nature of the globality of human culture. In this sense, the main point of any collecting process should be the clear definition of its purposes and philosophy.

2.4.4.- The changing paradigm of communication

Apart from collecting objects and artefacts, the central role of museums is linked to the communication of all these contents to the individuals and has evolved according to the very idea of museums. Starting from a linear instructive perspective, museums are currently

implementing a multidirectional model of communication, where the role of users has become more active at the time of acquiring knowledge. According to theoretical debates on knowledge and learning, there are four conceptual models applicable to museums communication. This section, consequently, briefly outlines the characteristics of each one of this model on the final part.

Since the appearance of the modern notion of museums, those have had a role of communicating contents to their audiences, independently of whom they were. As long as the perception of the potential audience evolved, the idea of communication and education changed accordingly to that evolution. And, consequently, the way in which museums communicate has evolved jointly with the role they played in society and so their definition as institutions (e.g. while *Kunstkammern* wanted to instruct people on the complete knowledge of the world, *Schatzkammern* were mainly conceived as mere signs of power or status of the owner) [Hein, 2002:186]. In other words, it is not possible to speak about a uniform paradigm of communication all along the history of museums, because it has changed accordingly to the needs and demands of the owners, the historical moment and the culture of the society in which it was settled.

Once the initial status of mere aesthetic experience or link to the supranatural powers was overcome, modern museums achieved a role as educational sites, where visitors were instructed about the contents the institution owned. The communication of those contents to the increasingly diversified audience has also evolved jointly with the history of museums as institutions. Until quite recent times, the communication of cultural and educational contents was made from a linear, unidirectional perspective, where the only actors were the curator (as transmitter of the content) and the visitor (as recipient of the content). Moreover, during most of modern times, the communication of educational contents pursued a clearly identified objective of instructing people and reinforcing a concrete model of society with its value and holistic perception of the surrounding world. One clear example of this trend of communication of contents is the Pitt Rivers Museum in Oxford, which was established during the Victorian period following evolutionist theories and displayed its contents according to them [Owen, 2006; Petch, 2006]. In all of these attempts, the producer of the object or message (mainly curators and authorities of the institutions) was the most determinant factor defining the experience of the customer.

With the quite recent introduction of new scientific disciplines such as sociology or pedagogy into the realm of museums and museology, however, the above mentioned linear unilateral communication paradigm has evolved into a more complex one. In fact, the role played by the mass communication in this process is really important, because it enables a more continuous and flexible paradigm where individuals adapt the message to their personal context. In other words, the same message can have different readings depending on the context of the recipient. And this new more flexible process of emitting and receiving the message clashed directly with the previous unidirectional perspective. In fact, as Hooper-Greenhill stated, "the moment of reading is as important as the moment of creation" [1994a:25]. Any visitor to any museum, and even to its recently arising digital spaces, is not an isolated body, because they will always arrive together with their personal background and framework, which will condition all the new contents to fit into their pre-existing conceptual categories [Ham, 1994:110-111]. That is why communication is now seen as a process between two actors, the one transmitting and the one receiving, with a message that will be interpreted independently according to the circumstances of the recipient. This means that also the discourse can no longer be linear, because the content providers (museums and on behalf of them curators or museums pedagogic staff) have to take into account that it will be modulated by each content gatherer individually, selecting the parts of the content they want or know that can be easily adjusted to their current conceptual frameworks. "**Learning is a continuous, active process of assimilating and accommodating information within social, physical, and psychological contexts. Learning involves more than mere assimilation of information; it requires the active accommodation of information in mental structures which permit its use at a later time**" [Falk and Dierking, 1992:113]. The 'significative' of the message can still remain the same, but its 'signifying' will change greatly accordingly to each visitor.

Associated to the nature of the message, there is another associated debate that can be identified as the one between the 'realist' vision of the museum and the 'idealist' one [Hein, 1998:17]. The first one states that knowledge exists outside the human being, independently from him. In this case, museums should take the knowledge and merely 'present' it to the audience as it is. The idealist vision, on the other hand, believes that knowledge only exists once the individual has taken the information presented and processed it to become part of his previous conceptual framework's knowledge. This dichotomy is also presented when facing the role played by the visitors or users. While

some authors identify visitors as a passive recipient, others state that visitors are to be seen as active constructors of meanings and ideas.

According to Hein [1998], the intersection of these two debates creates as a consequence four main conceptual types of museum: 1) the didactic-expository based museum; 2) the stimulus-response based museum; 3) the discovery-learning based museum; and 4) the constructivist museum.

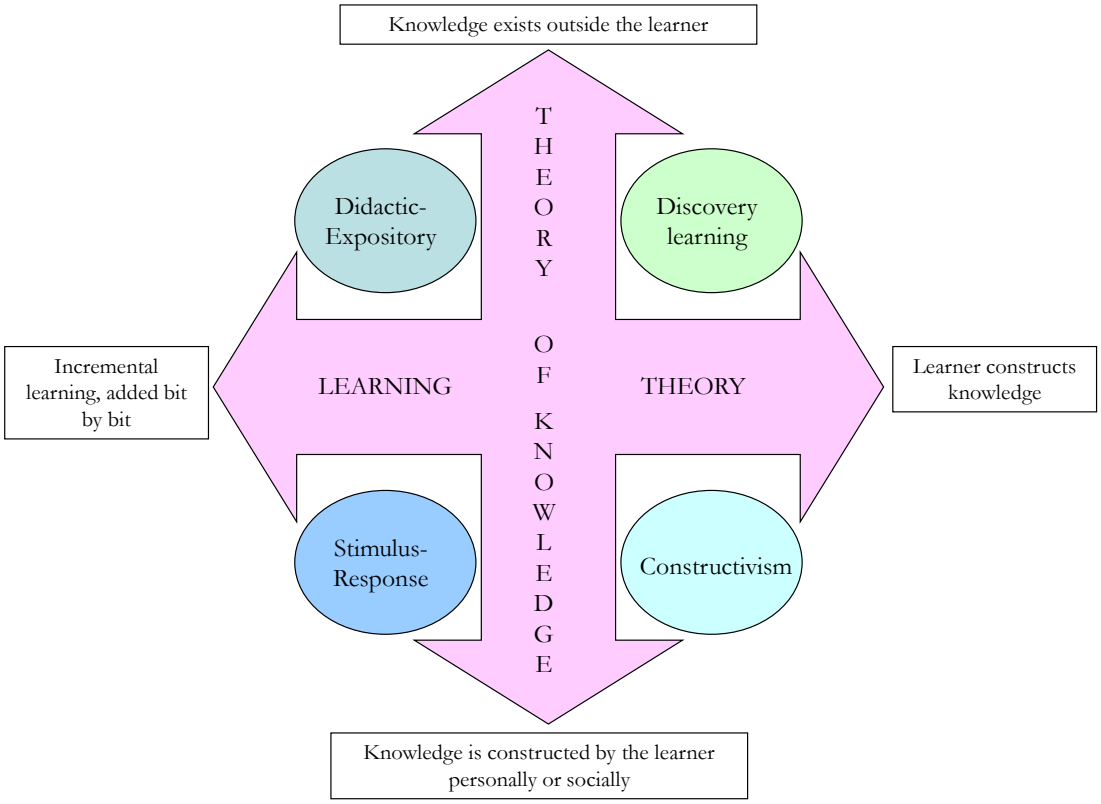


Figure 3: Debates on educational theories regarding museums. Source: adapted from Hein, G.E. [1998:25]

The didactic-expository based museum

This kind of museums pays more attention to the subject to be taught than to the learner. The outside independent knowledge is absorbed little by little by the learner according to the information provided by the content provider. So, the visitor is more passive than in other museums, because the importance of the knowledge acquiring process resides on the object and the museum staff that prepares the information to be provided to the visitor. Everything that has to be presented to the visitor has to be previously analysed in order to find the essential structure of the knowledge. After that, knowledge has to be divided into the most easily learnable units. According to Hein [1998:27-29], museums inscribed within

this theoretical model, present linear sequential exhibitions with describing didactic components (labels, panels) and a hierarchical arrangement of subjects from the simplest to the most complex ones. The school and educational programs will also follow a traditional curriculum with specific learning objectives for each presented content.

The stimulus-response based museum

The stimulus-response based museums are equally based on traditional didactic components providing the information to be learned. They are also organized with a linear discourse, with an order, a beginning and an end. But, conversely to the didactic-expository museums, the knowledge is not an independent being that exists outside the learner. Even in the information is presented by the staff, knowledge will only become a fact once visitors discover things by themselves. In this sense, visitors are expected to have some kind of "epiphanies – they suddenly understand some idea or concept, regardless of the instructional method to which they are exposed" [Hein, 1998:30].

The discovery learning based museum

Museums based on the discovery learning state the existence of the knowledge outside from the learner, but it will not be acquired by them, unless they construct their own meanings. The visitor will learn what he wishes to learn or what he is capable to learn by discovery, because no imposed learning will work. The visitor acquires a more relevant and active role than in the previous two typologies of museum, even if the knowledge is supposed to exist independently from them. If the information provided is the correct one, visitors will necessarily arrive at correct presumptions or knowledge of the world. Exhibitions will not be arranged linearly, because visitors will construct knowledge in the order they want, and even choosing the parts they desire and rejecting the others. And so, according to Hein [1998:33], discovery learning-based museums will present exhibitions that encourage non-linear exploration and a wide range of active learning modes, where the didactic components may ask questions to the visitors, prompting them to find out for themselves. All the content should lead visitors to discover some accepted and acceptable conclusions, avoiding the strict previous 'correct interpretation of the professionals' in order to achieve a more personal degree of learning.

The constructivist museum

Finally, the constructivist museum is the typology where the main stress of the exhibition is put on the visitor, because they assume that learners construct knowledge and that there is no knowledge outside from them, because information has to lead to socially or personally constructed knowledge. According to this typology, the essential component of any exhibition is not any object, but the learner. Experiments will be on the base of the constructivist exhibitions and nearly any conclusion or result will be acceptable as real knowledge. This last fact is only possible, because any knowledge cannot be evaluated as valid or wrong from the outside, but from within the conceptual knowledge structure of the learner itself. People construct meaning on their own from experience. That is why the constructivist museums permit many perspectives and interpretative approaches, but at the end they will also provide users with tools to validate their conclusions, even if they do not match the ones intended by the curators. "Thus, a constructivist exhibition:

- Will have many entry points, no specific path and no beginning and end;
- Will provide a wide range of active learning modes;
- Will present a range of points of view;
- Will enable visitors to connect with objects (and ideas) through a range of activities and experiences that utilize their life experiences;
- Will provide experiences and materials that allow students in the schools programs to experiment, conjecture, and draw conclusions" [Hein, 1998:35].

Still nowadays these four different theoretical typologies of museums coexist and their translation to the digital sphere of the institutions will consequently be different, according to the ideal model they refer to when displaying their digital assets.

Modern museums have always had the role of communicating their contents to the audience. At the beginning, the communication model was clearly unidirectional and completely linear, with the audience as mere passive receptors of the message. During recent times, however, the more active approach to the role of users has created a more complex, dynamic and multidirectional model of communication. In this context, museums have to clearly define their philosophy of communication, taking into account current debates on theories of knowledge and learning. The different positioning of museums within this framework will answer to the four archetypical models of communication.

2.4.5.- Increasing access to cultural contents

Linked to the previous section, as the communication model of museums has evolved and become more complex, there has arisen a critical concern among cultural institutions, namely the broadening of access to cultural contents to all the members of society. This section briefly describes the different perspectives on access and finally chooses one of them as operative for this research.

Apart from the theoretical model of the museum their institution has, most cultural stakeholders are talking about increasing access to cultural contents and assets and decreasing differences fostering inclusion. Terms related to inclusion evolved since the very beginning, acquiring more complex connotations than in the initial times. The term 'social exclusion' was created in France in 1974, but at the beginning it had a mere economic perspective. Later on, it also embraced other perspectives, such as the cultural one. But in this realm the term has become incredibly ambiguous and it continues without having a clear definition, because access can be interpreted in different manners. According to some authors, the museum can be an ideal place to foster access and social inclusion, promoting processes of social change [Sandell, 1998:408; Coffee, 2008:261]

The main dilemma arises when policies really do not define access and inclusion, because museums may (and actually do) interpret it very differently. In fact, there are three main lines of thought and action concerning access in museums and to its contents: representation, participation and access [Coffee, 2008:271; Sandell, 1998:408].

The perspective dealing with *representation* defends that museums should carry out actions that foster individuals' or groups' ability to take part in the processes of being represented in the cultural realm, and, consequently, in cultural institutions such as museums [Coffee, 2008:271].

The second line deals with the increase of *participation* and, according to it, cultural institutions should promote ways so that everyone can enjoy access to the different processes of cultural production. Probably this is the perspective with less support among museums staff, mainly because they are not main actors in the cultural production process, but in the conservation, diffusion and communication processes.

Finally, the third one is related to the *access* itself. This line of action also embraces the both above, but in fact the main idea is that access of individuals to cultural contents has to be supported. Besides, this process is most of the times conceived from different points of view:

- *Physical access to the institution and its contents among the whole society*. According to this perspective, museums will have to work on social inclusion of all groups and so develop tools for an effective inclusion of all of them in their activities (e.g. minority groups, marginalized groups, special groups or elderly people, among others).
- *Access to information*. This means to made information of the institution and its contents available for everyone. So the main processes of this perspective can be identified as the multilingual contents (available for non-native language speakers) or the digitisation of contents (available for anyone anytime). Museums made basic or complete information available for the broad public, but with no further elaboration. It means the mere 'transposition' of their physical databases to the digital sphere.
- *Access to knowledge*. This one is a step beyond the second approach. After making information available to users, institutions try to create complementary 'activities' to help them learn the knowledge behind the current cultural content. It is some kind of educational-pedagogical perspective. The approach to those learning activities varies significantly among institutions. The first difference lies on the physical or virtual character of the activities. But probably the main difference can be identified with the degree of interactivity of the activity. It can range from mere contextualization of the content or links to other related contents to more dynamic and participative processes, where the user is supposed to acquire related knowledge by dealing with the content itself.

As can be seen, the definition of access and inclusion related to cultural contents remains highly undefined, even if some mainstreams of action are defined. Taking into account that the present research deals with the digital space of the museums, the perspective dealing with the access itself will be adopted and, consequently, access will be mainly defined as the capability of users to access information and knowledge of the cultural institutions.

Leaving aside the different models of the philosophy of communication, all museums share a common interest in increasing the access of audiences to cultural contents. Though there are differences on the perception of users, museums will define it mainly as the capability of accessing their cultural information and knowledge.

2.4.6.- Introduction of web technologies and their impact in the domain of museums

As happens with the society as a whole, cultural institutions are also implementing technological applications to improve communication processes of their contents. Although during the 90s the information provided was quite simple, current trends are asking from museums more complex and value added contents for the users. Accordingly, this section deals with the changes on the operational and strategic vision of museums in the current technological context, as well as with the challenges institutions face nowadays due to the implementation of these technologies.

During recent times, museums have experienced one of the most profound and remarkable transformations in relation to the adoption and implementation of technologies for the communication of cultural contents. Museums as a whole have been experiencing with diverse innovative technological applications, ranging from mobile personalized interactive guides to immersive virtual environments, among others. The still developing technology in some cases and the disturbance of the needed infrastructure in other ones, however, has not helped in order to firmly and permanently establish these kinds of technological applications. The simplicity and great effectiveness of the web technologies [Aibar, 2004:19], conversely, have been key for the great success they have among cultural institutions and more specifically museums. The Internet and all web-based applications are experiencing a remarkable success among museums to better communicate their cultural contents to an increasingly broaden audience. Never before the communication and delivery of contents has been so easy and cheap than currently, due to the progressive decrease of resources needed for an optimal use of the web technologies [Hilbert, 2001:33]. Once the contents are made available on the web, any user can access them infinite times from anywhere by simply getting connected to the network. This cheapness of making the information accessible to a broader audience with no significant increase in the global costs of the operation has driven many institutions to make an intensive use of the available and even of the currently developing web-based technologies and applications.

The first attempts for the implementation of web technologies in museums took place during mid-90s, when some of them started to develop some kind of digital version of the institution. These first initiatives, however, were clearly based on purely plain information communication [Roca, 2009:179]. These were mainly the initial steps on the web technologies implementation process, but it rapidly developed into more complex applications. In fact, apart from the mere informational content, many museums have also created a digital version of their actual content and holdings. Consequently, museums have created a version of themselves in the virtual sphere with electronic reproductions of their material cultural contents [Normore, 2003]. As time went by, museums, really aware of the new potentialities of the recently arisen technological application, began making a more innovative, complex and even appealing use of them. A clear example of this trend was the online real time broadcasting of the restoration of a painting in 1999 by the Minneapolis Institute of Arts [Marty, 2007:338]. Web-based technological applications, moreover, has provided museums with the opportunity of reinforcing their educational role by means of delivering more complex information and educational resources to the virtual visitors simply accessing the digital version of the institution [Belli and López Raventós, 2008:160]. Besides, some museums have gone a step further by creating interactive educational resources or even edutainment activities.

Nowadays, the ongoing web 2.0 trend[27] is reshaping also the relationship of museums with their audiences through the use of technologies. In addition to the obvious easier access to cultural contents, web 2.0 tools have facilitated a more spontaneous, interactive and dynamic mean of communication with the users [Fundación de la Innovación Bankinter, 2007b:5]. Moving away from the static unidirectional institutional communication of the previous web technologies' implementation model, the new tools open up unexpected possibilities for a direct multilateral communication, but also the opportunity for the users to personalize the access and consumption of the desired contents. Users have moved from a passive receptor role to a more interactive one of producers of the contents that will be consumed by others in a cyclic structure. In other words, users are no longer mere consumers of the delivered content, but prosumers [Bloem, van Doorn and Duivestein, 2009:16; Valtysson, 2008:8]. Some institutions, such as the Thyssen-Bornemisza Museum, the Art Institute of Chicago or the J. Paul Getty Museum, among others, have already started to implement and experience with these new

[27] For a more detailed explanation of web 2.0 and the related tools, see section "2.2.2.1.- Brief overview on technological applications".

tools and ways of communicating with the users. Currently, however, this is not the majority trend, since many institutions prefer to adopt a more passive attitude in order to be sure of the success of the technologies to be adopted [Carreras, 2005:180]. That is to say, some museums are pioneers on the implementation of innovative technological applications, while many others are merely waiting for the outcomes to become later adopters of the successful ones.

All this technological development has had, obviously, a profound and perceivable impact on the cultural sector as a whole. After two decades of networked personal computers and of the implementation of the World Wide Web, technologies have changed all the operations and strategic vision of cultural institutions [Peacock, 2008a:333]. **This change does not merely affect to the nature of the contents embraced by the institutions, but also to their organisational and philosophical conception** [Peacock, 2008a:347; Peacock, 2008b:60; Marty, 2008a:7; Healy, 2002:482]. Integral models of management of the institutions have to be redefined due to the great impact that technological implementations have on the whole system of creating, distributing, storing and accessing cultural contents. That is why the proper adaptation to the new technological juncture has to be considered key for the survival of any organisation [Peacock, 2008a:346], although the real impact and meaning of the organisational change on cultural institutions still remains as a non-deeply understood phenomenon [Peacock, 2008a:340, 344]. Actually, some argue that all the organisational and philosophical changes in museums and cultural institutions do not respond to a desire of fostering creativity and renewal on the sector, but of answering to external pressures, anxiety and unknown risks [Peacock, 2008a:341]. Anyway, the complete redefinition of cultural institutions and their managerial processes has opened many opportunities to become more competitive on a global market and, even, to better attract and maintain their audience.

This transformation of the sector, thus, has supposed some challenges for all the cultural institutions and cultural operators as a whole. There is an obvious need of integration of both the real and the virtual ambits of the institutions [Galani, 2003; Galani and Chalmers, 2002; Galani and Chalmers, 2004; Soren, 2009:235; National Museum Directors' Conference, 2004a:31-32], because a disconnection between them would lead to an indefinition of the organisational structure of the institution, as well as to confusion among the visitors. The digital version of the institutions should be a reflection of what the current

one is, conceived as a complementary part of the whole structure and organisation. This digital version of the institution has to present and deliver contents to the users and, even if at the beginning the simple digitisation of the actual holdings was sufficient, currently users seek for more added value, more useful experiences [Cole, 2002; De Silva, 2003:1; Marty, 2007:355; Marty 2008b:31; Normore, 2003]. The creation of these value added experiences are most of the time resources consuming for institutions, but users, as have become more technology savvy, demand them increasingly as an integral part of the knowledge acquiring process. Some institutions, actually, have to deal with the challenge of not only digitizing the cultural contents, but creating new ones. This fact has created a new situation, where cultural institutions have to deal simultaneously with digitized objects and digital-born ones [Cole, 2002; Lynch, 2002; European Commission, 2002a:181-182]. Although this difference might not seem crucial, the management of these two kinds of contents differs slightly, because, whilst the digitized object has its roots on the material world, the digital-born one is result of an integral process on the electronic realm. Nevertheless, there are collections that present both types of contents intertwined.

Digital collections are more than mere repositories of the current contents and need to be complemented with additional information and appealing presentations [Lynch, 2002]. That is to say, a digital collection cannot be assumed to be a mere electronic replication of the current content, but to have an added value that other ways could not be made available to users. This is where the real value of digital contents and collections resides. Because the simple reposition of contents on the electronic space of the institutions does not mean anything else than an overwhelming amount of information for the user that will not be easily assumed.

In this sense, institutional people in charge of the contents should be very careful at the time of identifying what to keep, select, categorize and store in the current vast amount of information available [Healy, 2002:487; European Commission, 2002a:182; Normore, 2003]. The presented content has to be easily categorized and clustered into the knowledge structures of the users, because otherwise the risk of an overdose of fragmented thinking can hinder the mission of knowledge communication of the institution [Bloem, van Doorn and Duivestein, 2009:26].

Processes related to information building, contextualization and knowledge generation are the most complex and vital in the communication planning [Marty, 2008d:30]. Information represents the electronic transposition of the mere data, while knowledge adds value by making it more useful for users. Moreover, the current technological applications situation encourages new ways of interpreting knowledge [National Museum Directors' Conference, 2004a:31-32; Zorich, 2008:88] and different ways of communication and multimedia allow diverse kinds of content delivering, namely one to one, one to many or many to many [Bloem, van Doorn and Duivestein, 2009:14]. Obviously, all these changes have been possible thanks to the multiplication of digital contents and information. This digital information presents clear advantages for the management and the access, such as the possibility of making infinite perfect copies, the facility to transmit them through the web, higher interactivity possibilities for the users and the increasing speed of consults [Marty, 2008d:33; Ray and Day, 1998; Fidel et al. 1999:31]. But, obviously, it also has some disadvantages, because institutions have fear of copies and piracy of the content, there is a potential lessening of the authenticity aura of the contents, a blurring of individual museum identity and loss of details of the contents, among others [Marty, 2008d:33]. The complexity of the whole process, as can be identified, is great and cultural institutions have to be ready to deal with all the difficulties.

Technological applications are tools to manage unique information resources [Marty, 2008a:7], which open up opportunities for sharing content with a broader audience [Berman, 2008:49, 51-52; European Commission, 2002a:11; Nickerson, 2002]. Moreover, one of the features that has better helped cultural institutions to improve their processes has been the possibility of creating networks as basic organisational forms [De Silva, 2003:8; Suteu, 2006:324; Uzelac, 2006:305]. This networking process has fostered collaboration and cooperation among institutions in new ways previously unexpected [Nickerson, 2002; Kravchyna and Hastings, 2002; Berman, 2008:51; Marty, 2008b:217; Arnoldus, 2009:20; Marty, 1999:176; Ray and Day, 1998; De Martí and Zenou, 2009]. A clear example of original collaboration actions is the Google Art Project[28], launched the 1st of February of 2011. This site gathers together more than a thousand high resolution digital replicas of paintings of seventeen museums of nine different countries, as well as additional information of the included artworks. But collaboration and connections cannot only be made among institutions, but also with individuals and among them [Arnoldus, 2009:18].

[28] Google Art Project: http://www.googleartproject.com/ (Last accessed 2011-07-31).

In fact, technological opportunities have helped to implement collaborative filtering processes of the content [De Silva, 2003:8]. This new ways of collaborating, nevertheless, have begun to blur the boundaries between professional and amateur realms [Arnoldus, 2009:14].

In the collaborative processes, traditionally there has been an obvious priority use of curated, expert-led storytelling narrative arrangement of objects [Chan, 2007]. But this linear process of communication has started to change by the implementation of technological applications. In this situation, digitisation, virtualisation, networking, syndication and user-generated and co-created contents are new features cultural institutions have begun to utilize [Peacock, 2008a:333]. That is why cultural institutions should change their conception and star being centred the users, not in the content [Chan, 2007]. Anyway, museums never have to forget their roots and basic principles, even though technological applications are completely reshaping the panorama. Cultural institutions have to attract users also to their electronic spaces in order to form and inform them. But users, more demanding than ever before, also request entertainment while being formed [De Silva, 2003:2; Marty and Twidale, 2004] and websites are conceived as bridges to connect pre-visit and post-visit individual or collective activities [Marty, 2007:337]. **Because the complementariness of the virtual and real ambits is a constant that makes the replacement of one sphere by the other a non-realistic option** [De Silva, 2003:9; Marty, 2007:339; Thomas and Carey, 2005]. Or in other words, museums are aware of the importance of improving their processes in the electronic realm, because the intertwining of the digital and material spheres can better help them to answer the needs and expectations of users.

Technological implementation began to take place in museums during the nineties with plain information available. Contents are, from that moment on, instantaneously and cheaply accessible. Currently, however, there are attempts to create more complex and interactive applications and to adapt web 2.0 tools to the needs of museums. Anyway, technological implementation responds more to external pressures and risks than to a wish of renewal of the institution. In this sense, technologies have profoundly reshape operations and strategic visions of the institutions. Obviously, there is an increasing need of integrating the real and the virtual realms of the museums, creating more than mere digital replicas of the current contents. Technologies allow museums to create added value experiences for users, but they also represent a challenge for the institutions because of the double management of the real and the digital contents. One of the main potentialities of this technological implementation, additionally, is the possibility of generating collaborative networks among institutions or even with the audience itself.

2.4.7.- The role of technologies regarding museums

As the previous section has described, museums are facing a profound transformation and reshaping process not only in abstract terms, but also in more pragmatic ones. Technologies have opened up new opportunities for museums to improve their operational and communication processes. This section identifies the most important areas of implementation of technologies by cultural institutions, namely the eMarketing, the customer relationship, the eManagement and the digitisation areas. After briefly describing them, the section finishes making an initial approach to the actual implementation of web technologies by museums.

During recent times, museums are facing one great challenge, because the increasing introduction of technologies in all the spheres of daily life is also becoming true in the cultural realm. The implementation of technologies, more than a simple aesthetic change, implies a deep transformation of the cultural sector. This massive application of technologies implies for cultural institutions important challenges at the time of creating their own websites, digital collections, interactive experiences and, even, virtual museums. Cultural operators and content generators, however, many times apply available technologies to traditional practices of the museums, without having paid too much attention to the ways of users to interact with the system and the content or to the related cognitive, functional and aesthetic factors. This fact ignores that one of the main aims of technological implementation with cultural contents is to better the experience of the visitor. Technological implementation offers cultural institutions tools to avoid the mere electronic reproduction of actual contents, permitting them to add value to exhibitions by means of presenting complementary information that will not be available to access by any other way.

As understood, the cultural sector as a whole is undergoing a deep reshaping process, because technologies offer new possibilities for creating, storing and conserving cultural assets, as well as for sharing, accessing to, exchanging and expanding knowledge. So, influence of technologies in the cultural sector can be identified in four main sections: passing on of information and knowledge; global access to cultural heritage; preservation of cultural assets; and more efficient cultural research [Artnouveau, 2003]. Suitable technologies make possible to digitise cultural assets and to widen the access to them; to

stimulate the creation of new digital cultural contents fostering creativity and participation; or even to create virtual places where individuals can immerse themselves into new environments, interacting with them. The opportunities offered by the use of these technologies are enormous, but cultural agents have to bear in mind the skills they would have to acquire for an appropriate use of them. Related to this, there is an important theoretical debate on the digitisation process. Based on authors such as Sassen [2002], within the framework of digitisation there can be identified two interrelated but highly different processes, the digitisation itself and the so-called sociodigitization.

The first one only implies the mere transposition of the information in a digital format, while the sociodigitization incorporates characteristics of the social environment in which contents were created and digitized into the digital format. This distinction is really important, because the digitisation, as explained by Sassen [2002], will only be making a digital copy of one object, without contextualizing or framing it. On the other hand, the inclusion of some social components into the sociodigitization process makes it easier to understand the meaning of the cultural asset on its previous or even original context. The sociodigitization process is quite abstract, but it aims at founding a definite framework to understand and approach the processes of making physical objects digital. Anyway, nowadays museums tend to understand digitisation as the first definition and they only include digital information on the digitized content.

During the last decade, the amount of literature regarding cultural policies and programmes of implementation of technologies has increased significantly. Since the publication of the *DigiCULT* report [European Commission, 2002a], numerous institutional publications have treated the topic of the technological implementation in the cultural sector, not only for the digitisation and preservation, but also to reach a higher degree of competitiveness and economic benefit [European Commission, 2003a; European Commission, 2003c; European Commission, 2004]. As seen before, as a reflection of these processes of cultural planning, during last years the multiplication of actions and programmes related to innovation and culture have increased considerably.

On the other hand, literature has highlighted other more theoretical aspects, such as the contribution of technologies to human development [Council of Europe, 1997] and their impact in the cultural sector as a whole [Jeffrey and Nayman (eds.), 2001]. From the

perspective of the technological implementation in the cultural sector, nevertheless, there seems to be some lack in the knowledge, because there has not been a global exhaustive diagnosis of the degree and the way in which they are utilized by different institutions and cultural operators. Traditionally, the relation of the technological applications and the cultural sector has been examined from three different perspectives:

- Degree of use of technologies in the cultural sector [Carreras, 2004; Carreras [ed.], 2005; Carreras and Munilla, 2005].
- Typology of used technologies [Artnouveau, 2003].
- Way of implementing technologies: how, what for, with which contents and so on [European Commission, 2002a].

Cultural institutions present a complex model of potential application of technologies, due to their role in the cultural production and distribution value chain. They act as producers of culture, agents for preservation of cultural heritage, managers of cultural content and cultural services providers. Consequently, an appropriate model for technology implementation in museums should be concerned about those multiple options and embrace both the stages related to the cultural value chain as well as the operation management systems.

As can be identified, cultural sector is undergoing a profound process of reorganisation, fostered by the new possibilities available for the creation, storage and conservation of cultural assets, as well as for the sharing, exchange, expansion and access to the knowledge. The influence of technologies can be divided into four main sections, namely, exchange of information and knowledge, global access to cultural heritage, preservation of cultural contents and more efficient cultural research [Artnouveau, 2003]. Suitable technologies make possible the digitisation of cultural contents and the openness of access, the stimulation of creation of new cultural contents impelling creativity and participation or, even, the creation of new virtual spaces where individuals can immerse themselves in new environments and interact with them. Some cultural operators, for instance, besides using technologies for the digitisation of cultural contents, make use of them also for activities related to cultural digital creation.

Nevertheless, only the web technologies have a massive implementation among cultural institutions, because during recent years the multiplication of digital versions of them has been increasingly perceivable. This creation process of digital contents and spaces has supposed a great challenge for cultural institutions. But the incorporation of these virtual spaces to the cultural sector never means the complete substitution of the actual ones, but their complementation [De Silva 2003:9; Marty 2007:339; Thomas and Carey 2005]. On the contrary, they represent a great opportunity for institutions to broaden their audiences, making contents available to anyone. In fact, the presence of digital versions of cultural contents can impel some people to observe directly the real object, although they might not know it before having arrived at the digital version [Marty 2007:337-338]. The opportunities offered by technologies are enormous, but cultural agents have to bear in mind the abilities they have to dominate for an appropriate use of the technological potentialities and the needs and expectations potential users might have. Because the adoption and effective and definite application of technologies depends in a high degree on the context and structures of the society in which they will be implemented [Nordmann, 2004:24].

Consequently, the application of technological innovation related to the cultural ambit can be identified in four main ambits: documentation, information and collection management; restoration and conservation; didactic and diffusion; and artistic creation [Mediacult, 1999]. Nevertheless, even though currently the implementation takes place in all these ambits for the reinforcement and improvement of the existing relations among cultural operators, technologies and final users, the cultural sector presents an increasing complexity that highlights the importance of actions related to virtual heritage, digital preservation, digital archives, digital cultural creation, museums, exhibitions, virtual walks and edutainment.

Finally, it is important to remark that the delimitation of what can be considered digital culture is still subtle. Some authors, such as Martínez and Mendoza [2004], plead in favour of including within this field all the contents, which in any of the stages of creation, production, diffusion, communication, preservation or consumption have made use of the technological potential, being it the Internet, any digitisation process, Virtual Reality, Augmented Reality or whatever.

According to the complexity of all the processes related to culture and technologies, the integrated model should cover at least the following four main sections: eMarketing; eManagement; relationship with the customers; and Digitisation. All these sections, however, as mentioned before, will be almost completely implemented by web technologies applications.

1. eMarketing: The processes identified in this section pursue the conversion of potential customers into satisfied and loyal ones by means of using technological innovation for communication, sale or distribution[29]. So, implementing technologies in the ambit of the marketing, museums expect to take advantage of their potentialities to improve services such as products or tickets sales or the publicity of the institution using new ways of communication.

2. Relation with the customer: The use of technologies aims at dynamizing and speeding up the communication process among them, enabling a direct relation between the customer and the cultural institution. Thereby, the use of technology-based tools propel a more fluent and quicker management of services such as customer inscription to events, feedback tools between customers and the institution and provision of information to the customers. This way, the implementation of innovative means for the relation with the customer will fasten and highlight new communication channels with them.

3. eManagement[30]: The utilization of technological applications in this ambit tries to improve the efficiency of management of the business processes and the flows and integration of information. Thus, in this section there are two different categories of management: the institutional one and the one of the information about the cultural contents of the institution.

4. Digitisation: The objectives of the digitisation are manifold, because it enables the cataloguing, conservation and diffusion of the information of those cultural objects. This may be the most complex visible area of implementation of technologies, because it has to deal with many different issues. The first of them is the preservation and digital storage of the cultural assets, but completely related there is also the problem of

[29] Based on RRC eMarketing: http://www.rrc-emarketing.com/ (Last accessed 2011-07-31).
[30] Based on Dawes, 2002.

digitally cataloguing the cultural objects owned by the institution. Finally, as the culmination of this area, contents have to be made available to users in order to spread and share knowledge beyond the walls of the institution itself.

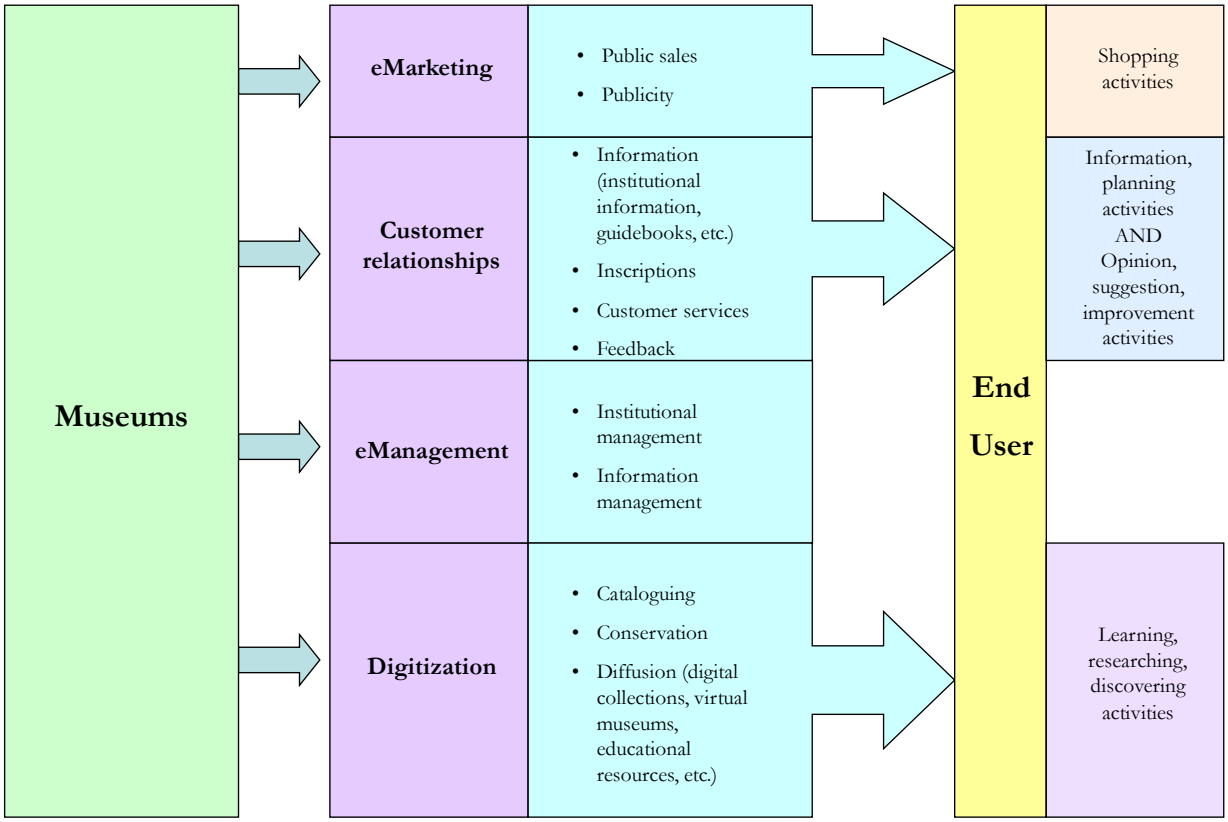


Figure 4: Conceptual model of the use of technological applications by museums. Source: own elaboration, adapted from Alzua and Gil, 2006.

The creation of digital spaces of museums has supposed a great challenge for museums. But the incorporation of these spaces to the cultural realm will never suppose the disappearance of the actual museums [De Silva, 2003:9; Marty, 2007:339; Thomas and Carey, 2005]. Otherwise, they represent a big opportunity for museums to broaden their audiences making their contents available to everyone. In fact, the presence of a virtual version of museums can impel some people to visit the actual museum, even if they did not know about it before having found its digital version. As can be identified, all the areas of implementation of technologies arrive at the end user, except from the eManagement one, that will stay in the back office. The rest of them will be fully available to the end user, but the most important thing is that, though at the beginning it may be seen as something

completely strange, after a little time, the user will use those digital spaces to carry out activities with a clear equivalent in the physical world. In that sense, users will carry out shopping activities in the eMarketing space, information searching activities or opinion expressing in the Customer relationship area or learning, researching or discovering activities in the Digitized contents sites. That is to say, the digital virtual space of museums will provide users with the same chances to do their everyday activities and will complement museums physical activities. But what the digital space of museums will never do is replace the direct experience of being in contact with the cultural assets itself. And that is why the proliferation of digital spaces should not be seen as a threat for the traditional physical spaces of museums, but as an opportunity to expand and complement their activities using digital technologies.

Stemming from this conceptualization of the use of technologies by museums to establish their digital space, most of the institutional websites have similar structures, related to three different categories of sections mentioned above. Apart from that, there is usually the option of visualizing the map of the website to easier access the desired contents.

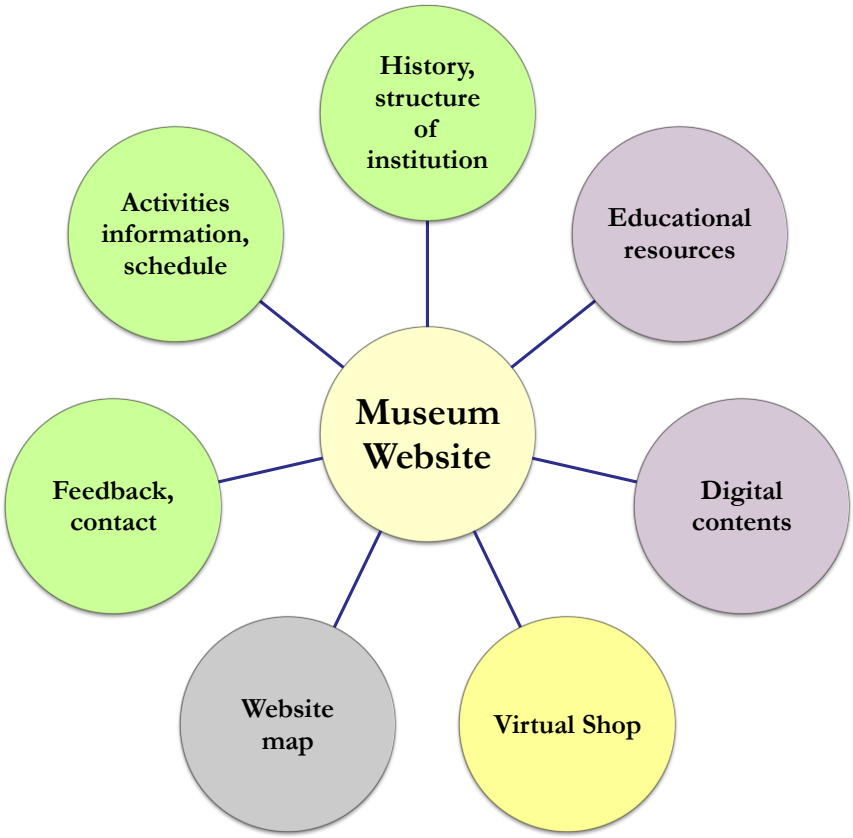


Figure 5: Conceptual general structure of museums websites. Source: own elaboration.

The first big section, and the most common one among the websites of the museums, is the customer relationship one. There institutions cultivate their relationship with the potential customers, giving them information about the institution, its activities or even, in the most complete cases, some ways to send them opinions or feedbacks. Usually this section appears divided into some subgroups, but the most common structure is to have three different tabs. One of them will be a presentation site, where the website normally explains the history and structure of the institution itself. The second one will be the one presenting the schedules of the museum or information related to its different activities. Finally, there will be also a feedback or contact tab, but in this case the structure ranges from simple contact addresses to more complete digital forms.

On the other hand, the eMarketing section will be translated into the website of the museums with the common label of virtual shop. In these shops, customers can buy items related to the institution. Usually, items are delivered digitally (in the case of images, articles, ebooks or digital reproductions of the cultural assets) or physically (in the case of souvenirs, books, reproductions and so on).

The last main section is the one dealing with the contents of the institution. In this case, the digitized objects are usually available to the user in the collection tab, but in some cases there are also some educational resources in order to help in or reinforce the process of acquiring knowledge. Regarding the collection part itself, the first aspect to observe is if the website presents any way of browsing or searching into its holdings. It is also very important to delimit the extent of the holdings presented, as well as the way they are shown on the website. Briefly, a figure of the general theoretical options of museums websites can be as follows[31].

[31] See section "3.2.1.- Variables of the research" of the methodology for a deeper explanation of the concepts.

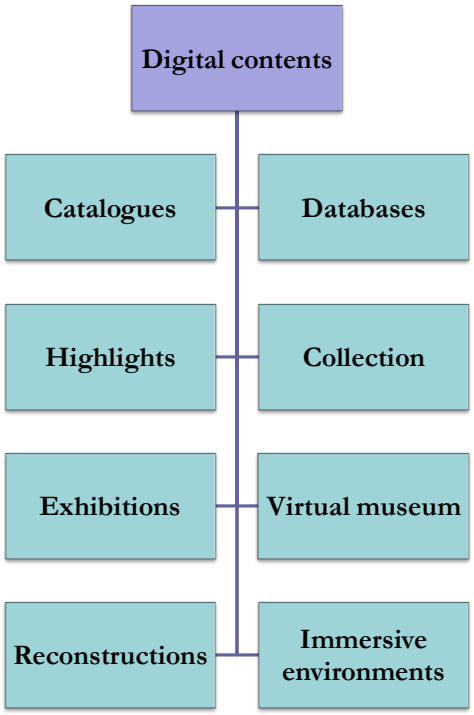


Figure 6: Potential parts of the collection section of any museum's website. Source: own elaboration.

On the other hand, taking a look at the educational resources, there is a hierarchical structure for their character, because they can be as simple as the mere contact form, but also ranging to virtual or edutainment activities[32].

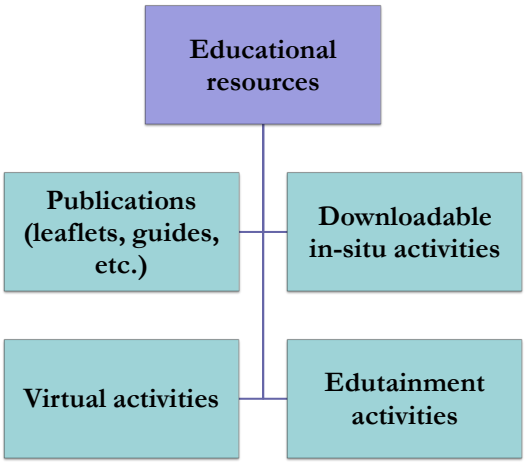


Figure 7: Potential parts of the educational resources of any museum's website. Source: own elaboration.

[32] See section "3.2.1.- Variables of the research" of the methodology for a deeper explanation of the concepts.

Consequently, museums face a great challenge at the time of adapting themselves to the current technological panorama in order to give answer to the needs and expectations of both their actual and virtual visitors.

The massive implementation of technologies by museums has influenced the procedures of museums in both the cultural production and distribution value chain, as well as the management processes of the institution as a whole. This process of technological implementation has been supported by cultural policies and programmes. Anyhow, an appropriate model of technology implementation in museums should embrace both the cultural value chain and the operation management systems. Consequently, technological applications are implemented in marketing, customers' relations, institutional management, content management and digitisation processes. Apart from the obvious processes of creating digital replicas of cultural contents, technologies facilitate the communication of the holding and resources of the institutions. From this perspective, museums have created websites to make their contents available with no time or space constraints. All these websites present similar structures, but the communication of contents varies greatly according to the philosophy of each museum. This communication philosophy is reflected on the features of the websites that range from simple information to more complex and interactive activities. Some websites also implement additional educational resources in order to reinforce learning processes of the users. As said before, all these features will respond to the background philosophy of communication of the institution.

2.4.8.- Visitors' behaviour on the institutional web environments of the museums

Cultural institutions are adapting themselves to the new technological juncture in order to improve their productive and communication processes. All the technological implementations done by these institutions, however, always have as an objective to better meet the real needs and expectative of users. In fact, the utilization of these technologies by the users will be the determinant factor to assess the success or failure of any application. That is why this section is centred on digital users of technological applications. Thus, the section deals with different theoretical models of information searching. Finally, it describes the recent figure of the digital natives, whose characteristics differ from the ones of the digital immigrants.

All the technological development and implementation will mean nothing but a waste of resources, if they do not respond to the very expectations and needs of the visitors or final users. The success or failure of the technological applications depends on their proper utilization by users, because people do not always use technologies as expected or performing to the full potential [Healy, 2002:481, 487]. As mentioned before, the most

successful technological applications in cultural institutions and, consequently, in museums are the ones based on web technologies and their use cannot be witnessed as could happen with other in-situ ones. That is one of the reasons for the persisting uncertainty about the actual behaviour of the users of web applications [Thomas and Carey, 2005]. It is generally accepted that visitors to the virtual ambit of museums access the content looking for any needed information [Kravchyna and Hastings, 2002], mainly in terms of a visit planning or general information seeking [Thomas and Carey, 2005].

The mediated digital domain of the museum should support conversion of the virtual visitors into cultural participation in museums' facilities [Thomas and Carey, 2005; European Commission, 2002a:12]. This should reinforce the integration into one individual of the current existing prototypal figure of the virtual-actual covisitor of cultural institutions [Galani, 2003; Galani and Chalmers, 2002; Galani and Chalmers, 2004]. The new kind of covisitor will make use of both ambits of action of the institution, but this behaviour will be clearly influenced by the social and personal context, since social interaction has become central in the whole technological experience [ENISA, 2010; Galani, 2003; Galani and Chalmers, 2002; Galani and Chalmers, 2004; Howard and Massanari, 2007:846]. In fact, one of the most appreciated uses of the web applications of cultural institutions is the after visit recall, fostered by the image viewing [Thomas and Carey, 2005]. Anyway, although it happens in a lower degree, some people access cultural institutions websites seeking educational and learning resources [Thomas and Carey, 2005]. Generally speaking, however, museums have to attend to all the spectrum of the audience. Needless to say, virtual ambits will have to complement the real ones and foster the process of designing and implementing transformational experiences for the audience in both spheres [Soren, 2009:234]. That is, as it happens on the material realm, web applications should impel users to discard old ways of thinking and provide possibilities of constructing new knowledge and exploring original ideas and concepts [Soren, 2009:248]. Or in other words, the conceptual and philosophical mission of museums can be improved by an optimum use of technological applications.

Related to the previous statements, it can be affirmed that Internet and web applications change fast, but people, their information needs and behaviours are harder to be transformed [Spink et al., 2001]. Human ways of acting and behavioural structures do not remain immobile, but their changing process is slower than the technological one. Anyhow,

currently, as users have become more information savvy, their behaviour and information needs have also become more complex than ever before [Marty, 2008a:3]. Although the relation between technologies and users is bidirectional, many implementers have omitted it and their applications have suffered important failures. Applications that take into account actual needs, expectations and behaviour of users, on the other hand, have become the most successful ones, because technological use and structure of functioning depend greatly on the human factor and should, consequently, be constructed on its basis [Aibar, 2008:12; Silberglitt et al., 2006:188].

In general terms, human information behaviour can be described and divided according to four main stereotypes [Wilson, 2000:49-50]. The whole process will be identified as information behaviour, while the final utilization of the accessed contents can be labelled as information use behaviour. In the middle stages of the process, however, other two phenomena can be delimited. On the one hand, the information seeking behaviour that represents a purposive active process to satisfy a main goal; on the other, the information searching one, which is the micro level of interaction with the information.

If attending to the different ways of looking for information, however, there can be distinguished other four main theoretical models [Choo, Detlor and Turnbull, 2000:2-3]. First, the broad scan of information with no specific need in mind can be labelled as undirected viewing. If the aim of the scan is an overall evaluation of the whole available information, on the other hand, the process becomes conditioned viewing. When the individual makes a relatively limited and unstructured effort to deepen knowledge and understanding through seeking, nevertheless, the way of looking for information is identified as informal search. Finally, the formal search is characterized by a deliberate and planned effort to systematically retrieve information. Additionally, other general distinction can be made when talking about information looking, because it can be linked to exploration or to active searching [Chen et al., 1998:582]. Exploration is related to browsing and relying on pre-existing mental models of information organisation [Chen et al., 1998:583], while searching is represented by a proactive request effort for information [Chen et al., 1998:584]. Searching, as a human activity, has some specific characteristics and procedure structures [Wilson, 2000:52; Choo, Detlor and Turnbull, 2000:3]. The whole activity is divided into and characterized by starting, chaining, browsing, differentiating, monitoring, extracting, verifying and ending.

The worthlessness of an increased difficulty in terms of effort and results of the queries' scheme make the average profile of users' search easy to define [Jansen, 2000]. In average, a user utilizes 2.21 terms per query and 2.8 queries per search [Jansen, Spink and Saracevic, 2000] and the majority of web uses never visit more than ten results, with two thirds never visiting more than the average 2.35 pages [Jansen, 2000; Jansen, Spink and Saracevic, 2000][33]. Generally, search is based on previous experiences [Fidel et al., 1999:27] and, logically, hands-on Internet experience is an important advantage [Howard and Massanari, 2007:861]. In fact, experience, time and effort refines searching terms and skills of the users, becoming the process a sophisticated search [Howard and Massanari, 2007:847]. This process of sophistication is built around success and failure experiences [Howard and Massanari, 2007:849] and the process can be considered completed when the user looks for information about specific questions to use it in multiple domains of life, several times a day with multiple search engines, finding what sought and being confident in the results [Howard and Massanari, 2007:848]. Thus, user behaviour of technologies and the presented information cannot be considered a simple process, but a complex and continuously developing one, although some basic features will remain hardly transformed.

Finally, there are differences also at the time of analysing the relationship of individuals and technologies. Leaving aside the technologically excluded users, currently there have been distinguished two main profiles of users regarding their familiarity with technological applications. People who have always been surrounded by technological applications and making intensive use of them are known as digital natives [Lusoli and Miltgen, 2009:9; Rapeti and Cantoni, 2010:40], while individuals who have adopted them in a later stage of their lives are digital immigrants [Jones, 2008:23-24; Prensky, 2001:1-2]. Consequently, young people are usually considered as digital natives [Lusoli and Miltgen, 2009:9], because technological massive implementation started to take place more than a decade ago. Digital natives present different features at the time of interacting with technologies and information. Digital natives think and process information differently [Prensky, 2001:2], receive information really fast [Prensky, 2001:2], prefer graphics to plain text [Prensky, 2001:2; Fidel et al., 1999:135], network best [Prensky, 2001:2] and do not like guidance, but random access or hyperlinks [Prensky, 2001:2]. The removal of restrictions of space and time has completely reshaped the measuring perception of the digital natives [Marty,

[33] Regular information retrieval systems are three to seven magnitudes larger in terms of searching [Jansen, Spink and Saracevic, 2000].

2007:339; Marty, 2008c:79; Ray and Day, 1998] and these individuals are used to access the wished content with no regards of the time or the place they are. There is, moreover, a new form of technological interaction that has arisen among them under the figure of the 'social gamer' [Belli and López Raventós, 2008:177]. With all these characteristics, digital natives are the desired prosumers in the interactive and participatory culture of reusability [Bloem, van Doorn and Duivestein, 2009:16; Valtysson, 2008:8]. All these differences with digital immigrants suppose that, obviously, their use of technological applications will be more sophisticated.

Virtual visitors are the final users and objective of any technological implementation. These visitors use web technologies in order to fulfil their information needs. Anyway, virtual visitors are usually also real ones and their social and personal contexts influence the interaction with both the actual institution and its digital version. Attending to the digital sphere, users' behaviour greatly depends on their informational and learning needs. In this sense, different theoretical archetypical models of behaviour have been identified by previous researches. Anyhow, the behaviour is mainly based on previous experiences and on the degree of sophistication of the searches of the users. Logically, the familiarity with technologies is really important when interacting with the web applications and it brings a clear differentiation between the figures of the digital natives and the digital immigrant ones.

2.5.- Brief summary of the object of study of the research

Museums are the object of study of the present research. Within the cultural sector, these institutions have a long tradition and well-established reputation. Their role as preservers of the cultural heritage and communitarian memory has been a constant since ancient times.

The concept and perception of museums, nevertheless, have evolved together with historical and social times. In this sense, from authoritative communicators of the unidirectional content, museums have evolved to become more participative educational institutions in which the audience plays a more active role.

This conceptual change has been fostered, additionally, by a gradual massive implementation of technological applications that allows a more direct and instantaneous communication with the visitors as a whole. Thus, the reach of the communication power of museums has been widened enormously and moved on towards a new paradigm.

All these transformations do not simply mean an adaptation of museums to digital contents, since they have a more profound impact on the organisational conception, the management processes and the philosophy of communication. Therefore, all the recent changes are highlighting the need of an insightful reflection of museums on their role in the Knowledge Society, with special emphasis on the philosophy of communication of cultural contents they implement on their digital realms.

Section 3.- Design of the study

3.1.- Theoretical framework

The Knowledge Society has brought great transformations for the cultural sector as a whole and, consequently, also for museums [Healy, 2002; Hilbert, 2001; Sassen, 2002]. The structural transformation that has taken place during recent times has created a new field of research, made up of museums, technologies and users [Carreras (ed.), 2005]. Technological applications have supposed important challenges for the management of digital cultural assets and have opened up communication and delivery of contents to a broader audience in real time with no space limitations [Arnoldus, 2009:6]. In this sense, implementation of web technologies has been crucial for the survival and renewal of the institutions. On the one hand, technologies allow the adoption of new ways of communication and have, consequently, influenced the philosophy of communication of the institutions and their very nature on the digital sphere of the Knowledge Society [Peacock, 2008a:333]. **Museums, willingly or not, are facing the challenge to restructure their schemes of functioning and communicating with the audience in order to attract them and become even more appealing for their virtual audiences**. People, on the other hand, aware of the potentialities of web applications, are becoming more sophisticated in their information behaviour [Marty, 2008a:3]. They look for technological implementations that facilitate their information searching and fulfil their learning expectations easily. In this sense, audiences' behaviour has also been influenced by the technological implementation in the cultural sector. Therefore, technological applications adopted by museums have to ultimately answer to these needs and expectations if they want to succeed in the global market. All the technological

implementations are addressed to answer to the challenges faced by museums in the Knowledge Society. The current juncture has questioned the very nature of museums as institutions not in the physical material realm, but in the technological virtual one. Museums have traditionally always played a communicational and educational role in society [Hooper-Greenhill, 1994a; Kravchyna and Hastings, 2002], but the current existing paradigm has made necessary for these institutions to readapt their functioning structures and schemes to the new reality [Marty, 2008a; Peacock, 2008a; Peacock, 2008b]. Thus, the implementation of these web technologies and applications has profoundly affected both the communication of cultural contents, as well as the access by the end virtual visitors. Consequently, the present research has to deal with both spheres of analysis and further integrate them in order to obtain a complete and accurate panorama of the implementation and use of web technologies with museums digital collections and of the nature of museums in the digital sphere of the Knowledge Society.

3.1.1.- Online access to digital collections on museums' websites

Although during recent times the proliferation of digital collections in museum websites is a tangible fact, studies dealing with the real use of technologies by museums to communicate and made available these contents to virtual visitors and of those collections by the end user are scarce. Many website studies have dealt with usability and accessibility or even with pattern of use of the websites as a whole. But the in-depth analysis of the roots of the use of technologies by museums and the access of virtual visitors to digital contents presented in the websites is not a constant among them. Due to their longer tradition concerning museum studies, most of the studies come from Anglo-Saxon countries and they generally analyse the number of users of websites, their paths of visit or even their pattern of visit (duration, pages, day and time of visit, and so on), but they deal with very general topics of study such as visited sections or number of the visit. Some examples of those studies are the one carried out by Loran Gili [2002] on her dissertation about online museums and audiences on the United Kingdom, the article of Marty and Twidale regarding the usability flaws of museum websites [2004] or the "Canadian Heritage Information Network's 2004 Survey of Visitors to Museums' Web Space and Physical Space" [Statistics Canada, 2005], among others.

As mentioned above, there is a need of literature and research regarding the in-depth use of technologies regarding digital contents of museums. Having identified this flaw, the current

research aims at identifying specific patterns in the use of web technological applications by museums, as well as of digital collections by the end users. In fact, one of the main objectives of the study is to analyse the real use of web technologies by museums to reinforce the communicational and educational role of the institutions within the digital sphere. Mainly based on the educational theory of Hein [1998:25], the research assumes that the implementation of these technologies is not casual, because it derives from the philosophy of communication adopted by museums.

Closely related to this main objective, another aim of the study is to analyse the real use of those digital collections, dealing with who uses that kind of content, with which purpose are they used and trying to define some patterns of behaviour concerning not the general use of the websites, but the specific one of the digital collections. A better understanding of this use will facilitate the identification of areas to strengthen the application of technological applications related to cultural contents of the museums. That is, the identification of patterns of behaviour of the digital audiences can help to better deliver future services to meet the expectations of the virtual visitors of the digital sphere of the institution.

To pursue the mentioned aims entails facing several challenges. First of all, there are some clear external influences and exogenous factors for any institution when planning and carrying out the implementation of technologies with cultural contents. These factors play a moderator role and their influence on the main phenomenon fosters the creation of partitions of similarity due to their application on the measurement and analysis [Baron and Kenny, 1986:1173]. For instance, the stage of development of technologies can shape the type of technological adoption by museums. Many times initial ambitious scopes have to be rethought in order to be feasible with the current state of technological development. Similarly, the political framework will foster or hinder technological implementation with cultural contents, by means of the policy plans and programmes regulating the utilization of technologies in the cultural realm. Closely related, this policy planning will be intrinsically attached to the prevalent cultural values of the institutional ambit. In other words, cultural values background of the countries, regions or supranational entities could influence the use of technological applications by museums. Finally, also the corporate values have been identified as determinant at the time of implementing technologies, because the general

scope of the institutions as a whole has to be reinforced by the use of concrete applications.

Moreover, museums are aware of the fact that their principal task is closely linked to their users and their needs. From the perspective of this research, this relation is clearly bidirectional, because users are placed both at the heart of the communication process and as external actors that interact with the presented contents. On the one hand, museums, as educational institutions, can place users at the heart of their philosophy of communication, since they are the receptors of the message and contents and these ones have to suitably fulfil their needs and expectations in order to be successful. On the other, users have specific behavioural patterns with the digital contents of museums that answer to their needs of information. Consequently, users of the digital versions of museums should be located in both spheres of the whole communication paradigm of the institutions as passive ultimate receptors of the contents, but also as active agents of the interaction with them.

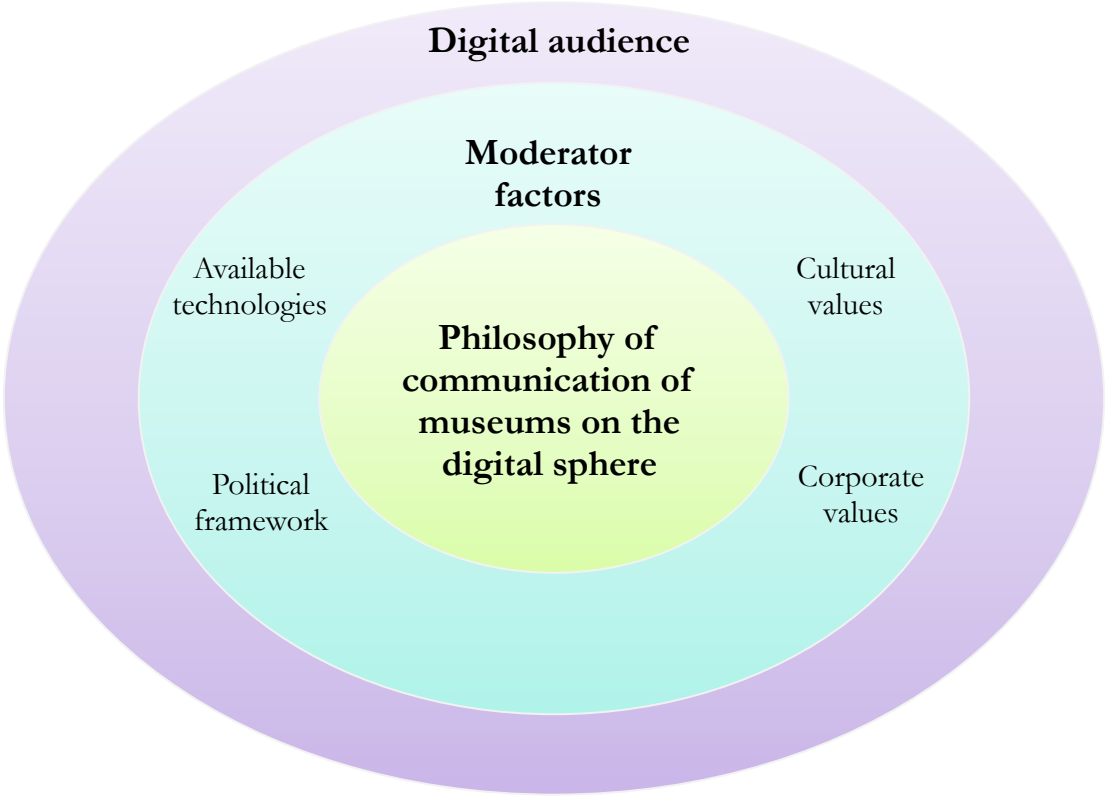


Figure 8: Paradigm of the communication of museums on the digital sphere of the Knowledge Society. Source: own elaboration.

Looking at the previous paradigm and leaving aside the external influences for the implementation of technological applications, there is a triangulation between three different actors, namely institutions, technologies and virtual visitors [Carreras (ed.), 2005]. Thus, museums have to create their electronic version of the institutions to make contents available for users. The use adopted will have profound consequences for the museum on the virtual sphere, since it will be the clear reflection of the fostered philosophy of communication of the institution itself. That is why the research has a twofold objective. On the one hand, it aims at recognizing the practical use of technologies made by institutions themselves through the identification of web implementations according to the philosophy of communication of the museums. On the other one, to identify patterns of use of the virtual visitors to museums websites in order to relate them to the technological implementation of the museums. The integration of these two parts will provide a whole panoramic view of the use of web technologies by museums to deliver and communicate their contents and the further real use by virtual visitors of the digital resources.

On the first place, when dealing with the implementation of web technologies by museums, it has to be taken into account that, since the irruption of their modern notion as preservers and communicators of culture, their evolution has progressed together with social and historical features. Museums are identified as institutions that reflect the memory and perception of the peoples themselves, as well as parts of the human knowledge related to cultural, human and natural contents. Museums represent in a variable degree the role of educational institutions since the late Modern Ages [Hooper-Greenhill, 1994b]. Recently due to the implementation of technological applications to the communication of cultural contents, museums have left their traditional role to face the challenges of this new juncture. Aware of the obvious necessity of being present in the digital sphere for a broader and more effective communication, museums have massively applied web technologies to the spreading of their contents and holdings.

All these communication improving efforts have a final educational purpose that is equally important in the digital version of the institution. Anyhow, museums implement very diverse features in order to achieve the educational goal of the institution according to their different notions, being it either at the physical place or at the virtual digital one. Underlying these differences of conception and implementation, the educational role can be influenced by the model of communication of contents that each institution

implements. Even if the differences may not seem huge, the models representing the different communication philosophies will have diverse consequences on the learning process of the visitors of the museum [Hein, 1998:25-35]. Consequently, the main topic and the first line of analysis of the current research is the web philosophy of communication of every museum. This philosophy of communication will drive and influence in a great degree the design and implementation of web technologies by the institution when communicating with the audience. Regarding educational purposes, the philosophy of communication of every institution can be identified by two different but completely interrelated theoretical approaches.

The learning theory adopted by each museum can delimit the degree of direct intervention of the institution of the learning process of the individuals [Hein, 1998:22-23]. There are two extreme perspectives when communicating the contents to the audience. One of them defends that contents should be filtered by the staff and specialists of the institution, making available to the users the most significant or valuable ones on the learning process. This direct intervention is the reflection of the conception of an incremental learning on the user, which assumes that users are mere passive receptors of the whole process. In other words, institutions process the most suitable information in order to improve the learning process of the passive users. The other perspective, conversely, supports a more proactive character of the users, since it defends the need of letting them choose among all the contents available at the institution. In this perspective, all the contents will be available for the users and they will be the ones discriminating them depending on their learning needs. The adoption of one of these perspectives supposes the implementation of different features on the space of the institutions [Hein, 1998:23]. This implementation of different features should also be reflected coherently on the digital realms of museums.

On the other hand, additionally, the conception of the theory of knowledge can also influence the implementation of web technologies by the museums. This theory identifies two main trends on the vision of the role of the institutions when presenting the contents [Hein, 1998:18]. The realist vision of the theory of knowledge assesses that knowledge exists outside the individuals and, consequently, it can only be presented to users. In this perspective, the acquired knowledge is real and equal for everyone. The idealist vision of the theory of knowledge, in opposition, affirms that the information presented has to be processed by each individual in order to assimilate and fit it into his conceptual framework.

Consequently, even though the presented information can be the same for everyone, the constructed knowledge will vary significantly since it gets adapted to the framework of every individual [Hein, 1998:21]. The adoption of one of these conceptions would also represent differences at the time of implementing web technologies related to the communication of contents.

Therefore, the positioning of the institutions on these debates on the learning and knowledge theories can determine the implementation of different features on their digital spaces. The intersection of these debates identifies the model of philosophy of communication of each museum expressed on the design and implementation of their electronic version to deliver and communicate cultural contents. As seen and supported by the literature review[34], there are four archetypical theoretical models of philosophy of communication expressed on the different institutions, namely the didactic museum, the discovery museum, the stimulating museum and the constructivist museum.

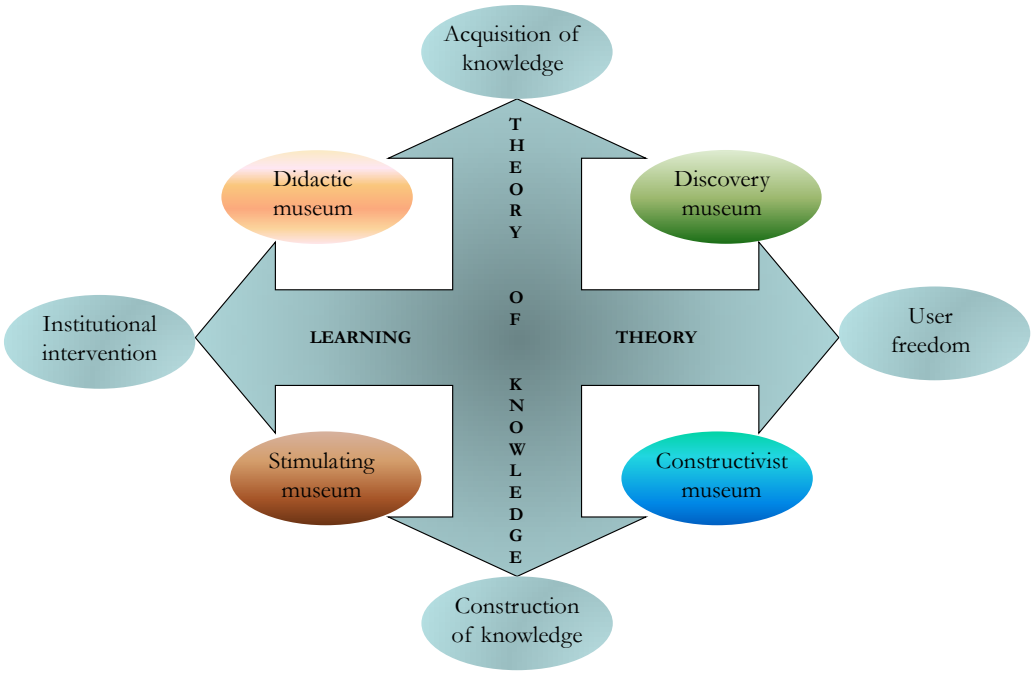


Figure 9: Theoretical model of the philosophy of communication of the museums. Source: own elaboration.

[34] See section "2.4.4.- The changing paradigm of communication" for a broader explanation of the different models of philosophy of communication of museums.

According to this theoretical model, the web philosophy of communication of the institutions is closely related to the way institutions present and communicate their contents through the institutional website. Thus, any website analysis hinges on the philosophy of communication of the institutions. As have been seen, the philosophy of communication of museums refers to the ways institutions make contents available to users. This philosophical perspective on communication arises from the intersection of the theory of knowledge and the learning theory. These two theoretical debates have been identified as the driving axes of the research. Each one of these two axes supposes a continuous measurement line between two specific extreme constructs. The intersection of the two axes is considered by this research as the identifying feature that places each institution within one of the above seen generic quadrants of the web philosophy of communication of museums. Regarding these two axes of the theoretical model, whilst the first one identifies the degree of independence of the knowledge from the individual, the latter one reflects the degree of intervention of the museums on the learning process. Moreover, in practice, the extremes of these two axes are identified by measurable constructs that stereotype the implementation of different features on the web of the museums.

On the one hand, the degree of intervention of the institutions on the learning process can be identified with the browsable or searchable character of the presented contents, as well as with their extent. This degree of intervention, consequently, is identified with the first one of the continuous axes between two specific constructs, namely institutional intervention and user freedom. The first one, as the denomination states, implies an active selection of institutions of the present contents. User freedom, conversely, allows virtual visitors to decide which contents to access. These two constructs have obvious features associated to the searching options of the website and the amount of presented digital contents. Browsable contents allow less independence than searchable ones. Similarly, the higher the amount of contents presented, the higher the degree of independence.

Looking at the theory of knowledge, equally, other two constructs can be identified on the second axe of the model. On the one hand, the first one is the acquisition of knowledge, which is deeply rooted on the realist vision of the knowledge. Related to this vision of existence of the knowledge out of the individuals, museums are its transmitters with no need of further development of the content. This vision presents information to users,

supported by the authenticity aura of museums. Conversely, the idealist vision of personal construction of the knowledge needs a more active role of the users. This perspective, therefore, does not support the absoluteness of the knowledge, because users build it according to their already existing mental structures. Consequently, this different theoretical vision of the knowledge is the basis of the construct of construction of knowledge, where, parting from the presented content, each user constructs a meaning that fits into pre-existing mental structures or schemes. Accordingly, features such as educational resources will be a constant for institutions supporting this vision. Similarly, the broader and more comprehensive presentation of information fosters the personal construction of knowledge.

Therefore, the theoretical framework of the philosophy of web communication in this research will be analysed from the perspective of the intersection of the previously mentioned two theoretical approaches and four constructs.

Nevertheless, any philosophy of communication has a common purpose, which is the fulfilment of the information and education needs of the users of the museum. Users are at the core of the planning process of the implementation of web technologies by museums, because they are the final receptors of the content[35]. Museums deliver and communicate their cultural contents to the audience and the implementation of web technologies to improve the communication ultimately aims at better fulfilling the expectations and specific needs of the users. Anyhow, users are also identified as external actors of all these processes, because their behaviour will be partly influenced by their needs, but also by the available information. Consequently, apart from the implications of the irruption of the web technologies on the philosophical model of communication of the museums, the remaining field of analysis of the research will deal with the behaviour of users on the digital sphere of the institutions. That is why the second great topic of analysis will be the behaviour of users within the web environment of the museums. Users behave differently and museums should be aware of the existing behaviour differences among them, because these different patterns and profiles of use will be determinant to assess the success or failure of their technological implementation. This definition of patterns and profiles of use will be, consequently, crucial for institutions. Logically, these differences on the use of the

[35] It has to be taken into account that the present research is centred on the analysis of the currently predominant static web 1.0 tools in which users are mere receptors. From the web 2.0 perspective, however, the virtual audience of the institutions are not only consumers, but also producers of the contents delivered on the digital sphere.

digital resources are expressed on different behavioural patterns of the users. Thus, the behavioural pattern of users is the construct that drives the final part of the research.

In order to fill the existing knowledge gap regarding the use of technologies with cultural contents by museums, the analysis for the current research is based on the triangulation of the institution, technologies and users. On the one hand, it will be centred principally on the philosophy of communication of the museums and its consubstantial reflection on the web technologies implementation. This part of the research will focus on the analysis of the features that materialize the ongoing debates on the learning theory and the theory of knowledge, which are reflected on the degree of intervention of the institutions on the learning process and the conception of knowledge as an objective or individual subjective object. Additionally, it will analyse the behaviour of the users on the digital environments of the institutions, determining patterns and profiles of use.

3.1.2.- Premises and hypotheses of the research

All these philosophical debates and trends are vital to understand the real state of situation of the implementation of technologies in the sector of the museums. Their application for the communication of the cultural contents on the institutional websites of the museums is the basis for the current research. Anyway, there are different perspectives for the analysis of the real use of technologies by museums to communicate their contents.

First of all, taking into account the different perspectives about the philosophy of communication of the museums, this philosophy would be affected by the final adopted theoretical model. Consequently, if technological implementation depends greatly on the philosophy of communication of the institution, museums with different perspectives on the ongoing theoretical debates would present diverse models of implementation of technological applications related to the communication of their contents. Therefore, the positioning on the debates could lead museums to different web technology implementations. Consequently, the first premise states as follows.

Premise α': Different archetypical technological implementation models relate to different philosophies of communication.

This theoretical and general premise, in addition, can be translated into more practical and concrete hypotheses to be tested during the analysis. Thus, the first premise is translated into measurable null hypotheses as follows.

Null Hypothesis 1 ($H_0 1$): There are no differences on the implementation of web technologies by museums.

Null Hypothesis 2 ($H_0 2$): There are no different archetypical models of web implementation.

Similarly, not only the philosophy of communication of the museum would influence the application of some concrete technologies, because, as stated previously, there are some moderator factors that influence the implementation and adoption of specific technological applications. Among these factors, the research has been able to analyse two of them, namely cultural values and corporate ones. Firstly, national conception of the institutions and their contents communicating role act as a moderator factor for the implementation of technologies. That is, the official definition adopted by the cultural bodies of each country and reflected on the cultural policies will also influence the model reflected on that country's museums. The cultural values of each country are reflected on the statements of their cultural policies. The research assumes that the definition reflected on national cultural policies seems to be highly influenced by the evolution and traditional conception of museums and culture on that country. So, if different philosophies of communication are identified with different archetypical technological application model and different communication philosophies are supported by diverse official definitions of the institution itself, different political notions of what a museum should be will have different technology implementation models on reality.

Equally, not all the museums have the same audience target and, consequently, their institutional communication models will differ in some degree. In fact, the research assumes that there are more specialized and targeted museum types comparing to others. For instance, anthropology museums tend to communicate for a more scientific audience, while history or art museums try to attract a broader and more general audience. The research assumes that pattern will be reflected also on the technological application model and, in this manner, the analysis will show some different features regarding different typologies of museum. Thus, the second premise states as follows.

Premise β': Different national cultural values and corporate values moderate the philosophy of communication of the institution.

This premise, additionally, can be translated into more concrete hypotheses to be tested during the analysis. Thus, the second premise is translated into two verifiable null hypotheses as follows.

Null Hypothesis 3 ($H_0 3$): Technological implementation of web applications does not differ by country of origin.

Null Hypothesis 4 ($H_0 4$): Technological implementation of web applications does not differ by type of institution.

Finally, the research has identified users not only as the receptors of the contents delivered by museums on their websites, but also as active actors that interact with them. Based on the theoretical models arisen from the literature review, the research assumes that the behaviour of users varies according to the archetypical implementation of web technologies by museums. That is, depending on the philosophy of communication of the institution and its reflection on the website, users will present different usage patterns. Users can be considered from two different perspectives. On the one hand, users can be considered as global actors, with no individualities within the group. Or in other words, users of the website of a museum could be considered as a whole entity and their behaviour will be analysed as a homogeneous phenomenon. From this perspective, bearing in mind that there would be further inner differences, global users' behaviour is considered as a standard within the virtual environment of a concrete institution. In this sense, users have different global patterns of behaviour on museum websites with different models of implementation of the technologies with cultural contents. Anyway, the previous statement does not presuppose that visitors to a museum website represent a homogeneous group. Conversely, the research assumes that there are plenty of visitor profiles to any website and will try to identify some patterns of use, related to the diverse features implemented on the sites. Thus, the last theoretical premise states as follows.

Premise γ': Users' behavioural pattern differs on websites of museums with different character and philosophies and their diverse features.

This last premise can also be translated into verifiable practical null hypotheses as follows.

Null Hypothesis 5 ($H_0$5): Global users behave equally on all the websites.

Null Hypothesis 6 ($H_0$6): Individual users behave equally along the different features provided by museums.

Hence, all these statements and hypotheses will be valuable to analyse and test the manifold objective of the research. First of all, the four first premises and their hypotheses will throw further light upon the actual implementation of web technologies by museums in order to communicate their cultural contents to the audience, taking also into account potential differences related to country of origin and type of institutions. On the other hand, the last theoretical premise of the research deals with the interaction of the users with the websites of the museums both in global and individual terms. Integrating the results obtained from both sides of the analysis, the research aims at obtaining a clearer and more defined vision of the state of situation of the implementation of web technologies by museums to communicate cultural contents.

Taking into account the different ongoing theoretical debates, the research pursues the objective of identifying the current state of the implementation of web technologies by museums on their digital collections and their real use by virtual visitors. In order to better answer to all the aspects of this issue, the research has identified the following theoretical premises and their correspondent working practical hypotheses.

Premise α': Different archetypical technological implementation models relate to different philosophies of communication.

- *$H_0$1: There are no differences on the implementation of web technologies by museums.*
- *$H_0$2: There are no different archetypical models of web implementation.*

Premise β': Different national cultural values and corporate values moderate the philosophy of communication of the institution.

- *$H_0$3: Technological implementation of web applications does not differ by country of origin.*
- *$H_0$4: Technological implementation of web applications does not differ by type of institution.*

Premise γ': Users' behaviour pattern differs on websites of museums with different character and philosophies and their diverse features.

- *$H_0$5: Global users behave equally on all the websites.*
- *$H_0$6: Individual users behave equally with the different features.*

3.2.- Empirical framework

The irruption of the structures and processes of the Knowledge Society in the cultural sector has brought important transformations for museums to communicate their contents. From this perspective, the theoretical framework has clearly identified two independent but interrelated areas of analysis, namely the philosophy of communication one and the users' behaviour one. Within these two broad constructs, different working variables can be identified for an easier analysis. All these variables will be structured into different sections of the research and their statistical treatment will provide the research with practical results to fulfil the objective of better delimiting the current stage of implementation of web technologies by museums and the use of these resources by the virtual visitors.

3.2.1.- Variables of the research

Following the two approaches of the research for the analysis of the use of web technologies by museums to communicate cultural contents and in order to answer to all the premises and hypotheses, the research has identified some variables to be used during the whole process. All these variables have been divided into two specific sections of the research, being assimilated to two different empirical models, namely the one of the philosophy of communication of museums and the one of profiling of the digital museum users.

3.2.1.1.- Empirical model of the philosophy of communication of museums

Answering to the different objectives of the research, there are different main constructs related to the use of web technologies to communicate cultural contents. Four of these constructs are related to the philosophy of communication of museums and other one to

users' behaviour. For an easier analysis of these constructs, they have been translated into measurable operative variables, assimilated to specific features of the web applications implementation and behaviour of virtual users. First of all, apart from the variables related to the constructs, some profile variables have been selected that will be useful in order to measure the influence of the moderator variables on the general model. These variables are the *country of origin* and the *type of institution* analysed.

Attending to the empirical model itself, the first part of the research deals with the philosophy of communication of institutional websites of museums. Linked to this general model, there are four constructs to be measured. As mentioned previously, these constructs are the institutional intervention, the user freedom, the acquisition of knowledge and the construction of knowledge. Website analysis, consequently, have to contemplate different features and sections that identify archetypical models of web technologies implementation. The translation of these constructs about the philosophy of communication into empirical variables has taken place in the framework of the following sections: presentation of the holdings, searching tool, presentation formats and educational resources.

Regarding the presentation of the holding of the institution, there are different typologies of technological application, depending on the amount of the contents presented, as well as on the way the user can interact with them. Consequently, this section deals directly with the constructs related to the learning theory, that is, institutional intervention and user freedom. The degree of intervention or freedom of the communication philosophy is analysed in this research by different features of the presentation of the holdings.

Highlights only present a selection made by the institution's staff of a part of their holdings, whereas *collections* tend to embrace at least a big part of them. That is why collections are considered more representative than highlights, because they do not depend on the staff's selection. These two terms do not refer to the type of presentation, but only deal with the proportion of the collection presented on the website.

Similarly, there is a clear distinction between *catalogues* and *databases*. The first ones have a browsable character, that is, they mainly present different areas, sections or groupings of the collection and the user accesses the contents by browsing within these categories

through web links. Databases, on the other hand, are searchable and enable visitors to access their desired content in a more focused and targeted way using specific searching terms.

The research identifies as *exhibition* not the digital display of the holdings, but its structuring on coherent groups. That is, the creation of coherent groups of digital items will be considered as exhibitions (such as the Tibet Album or the Luo Visual digital collections of the Pitt Rivers Museum).

Virtual museums, conversely, will be considered those applications that allow the visitor to wander around a digital version of the museum, having access to a big part of, if not all, the collection.

Related to this virtual museum, but clearly differentiated from it, the research created another category of *digital reconstructions*. These reconstructions can be either of a whole site or building, either of an artefact. This type of applications requires quite a big investment on technology as well as on human resources and that is why the research assumes that the amount of websites with this kind of technology will not be representatively high.

The final category, namely the *immersive environments*, also requires a huge investment and maintenance and it is not expected to be found on many websites. It allows the virtual visitor to enter into a digital environment and to move around it with very little limitations. Its main difference with the virtual museum is that this one can consist of 360º panoramic photographs of the rooms of the museum with links that guides the visitor to the contents displayed on each one, while on the immersive environments the virtual visitor can not only turn around himself, but also move freely through the rooms and access virtually to the holdings of each one.

Consequently, the presentation of the holdings of the institution has been translated into the following operative variables: highlights, collection, catalogue, database, exhibition, virtual museum, digital reconstruction and immersive environments. The aspects of this section that do not fit into any of these variables have been tagged as other. All this variables can be easily linked to one of the two constructs that lead this analysis. On the one hand, highlights and catalogues identify a trend of institutional intervention, while

collections and databases allow a great degree of user freedom. Similarly, the more complex presentations of the holdings are addressed to a more personalized access and, logically, they are linked to a greater degree of freedom.

Table 7
Variables of the section of presentation of holdings and relation to constructs.

Direct intervention	***User freedom***
- Highlights	- Collection
- Catalogues	- Databases
	- Exhibitions
	- Virtual museums
	- Digital reconstructions
	- Immersive environments

It is therefore important to also take into account if the website has some kind of searching tool and the level of search it supports. This section also deals with the constructs of institutional intervention and user freedom. The research has delimited three main groups of searching tools.

The first one is the *simple* searching tool that supports searches using single terms (one at a time).

The *advanced* search, on the other hand, is a little bit more complex than the simple one and enables the combination of various search terms (either free text or selected from predefined lists) in order to obtain more accurate results. In most cases, this second kind of searching tool allows users to also perform simple searches.

Finally, the third type is the *complex* searching tool which is the one designed for expert users and supports more technical or specialized scientific terms (one example is the searching tool of the database of the Museum of Archaeology and Anthropology of the University of Cambridge).

After the first approach to museums websites, the research identified that several museums do not have one exclusive type of searching tool, but a combination of them, which is characterized in the study as *combined* searching tool.

Therefore, the searching section of the analysis has been classified according to the following variables: none searching tool, simple searching tool, advanced searching tool,

complex searching tool and combined searching tool. The absence of any searching tool clearly relates to the institutional intervention, while the greater the degree of searching available for users, the greater their freedom to choose the contents. Consequently, ranging from simple searching tools to complex ones, the user freedom will be identified with the degree of the searching tools.

Table 8
Variables of the section of searching options and relation to constructs.

Direct intervention	***User freedom***
- None searching tool	- Simple searching tool
	- Advanced searching tool
	- Complex searching tool
	- Combined searching tool

Related to the constructs of acquisition of knowledge and construction of knowledge, the research analyses the way contents are presented to users. Concerning this analytical approach, the following terms and categories have been used in the analysis of the results.

Image is the digital replica of the physical aspect of the actual content.

Labels are the digital equivalent of the physical labels of the actual collections. Under this category the research considers the brief informative notes and phrases presenting the main facts about the object, mainly related to its identity.

More complete than those labels are the options of *explanatory texts*, creator details and contextualization of the object. Explanatory texts offer in greater depth details about the object (such as technique, composition, topic, and so on), while *creator details* present information about the artist or the person or group who created the object.

The *contextualization* category refers to the information about the context (historical, social, artistic, etc.) in which the object was created or to more specific contextual information about the topic that the object is dealing with. For example, if the website includes the painting "The Oath of the Horatii" of Jacques Louis David, some form of contextualization might be information about the history of those three brothers or about social, historical or artistic aspects of the French Revolution, period of the creation of the artwork.

If the website allows zooming the digital image of the content, it has been identified as *image zoom*.

Moreover, websites can deliver additional information related to the content or the author. In this case, there are two main options. If information about similar contents or even other content of the same author is available, the research has tagged it as *link to related works*. For instance, if the information about the above mentioned "The Oath of the Horatii" includes links to other neoclassical paintings or to other paintings of the author such as "The death of Socrates" or "Belisarius", it is considered that it includes some links to related works.

Another variation of this category is the *link to related news*, which can contain information about ongoing or recent news of the content.

Thus, when dealing with the presentation of the content, the research has identified the following operative variables: image, labels, explaining text, creator details, contextualization, image zoom, link to related works and link to related news. The features non classifiable by these variables have been identified as other. The simplest features of presentation of the contents are merely informative and descriptive ones that address to the realist vision of the acquisition of knowledge. The more complex and comprehensive features, however, allow users to adapt the presented content to their mental structures and, consequently, are linked to the personal construction of knowledge.

Table 9
Variables of the section of presentation of contents and relation to constructs.

Acquisition of knowledge	***Construction of knowledge***
- Image	- Author details
- Label	- Contextualization information
- Explaining text	- Image zoom
	- Link to related works
	- Link to related news

As mentioned when explaining these previous two constructs, the existence of educational resources on the institutional websites is an identifiable feature of the construction of knowledge by the users, due to the reinforcement of the learning processes they foster. Related to these educational resources, there are also some categories created by the

research in order to analyse this subgroup of the digital contents section of museums' websites.

The simplest feature in this section is the presence of a *schedule and contact* for the educational resources department. This will imply only that the museum has some kind of educational resources, but they have to be done physically on the space of the institution.

Another simple category is the *publications* one, identifying that the website presents the possibility to consult and/or download any publication related to the topic or the contents of the museum.

A step further, the research has identified the *downloadable in-situ activities* category as the one who permits to download some kind of activity related to the museum, its topic or content, but that implies a compulsory physical assistance there. These activities would be available to be browsed and downloaded from the electronic sphere of the museum, but they require visiting the actual space of the institution.

However, not all the activities require a physical presence on the museum and that is why there is a *virtual activities* category. Within it, the research has identified activities provided by the museum and whose accomplishment has to be made on the website.

Finally, closely related to the previous category, the *edutainment activities* are the combination of educational purposes with entertaining activities. These activities are usually youth-oriented, but they can be fulfilled by anyone, because their main aim is simply to acquire or reinforce some knowledge through entertainment activities. Because of the time investment that they require, the research assumes, once again, that this type of activities will not have a very high degree of presence among the institutional museums websites.

Thus, the educational resources section of the analysis identifies the following variables: schedule and contact, publication, downloadable in-situ activities, virtual activities and edutainment activities. Once again, if there is any feature that does not fit any of these variables, it is classified as other. Even though the greater the complexity and variety of educational resources imply a higher degree of personal construction of knowledge by the users, the research takes also the global existence of any educational resource as a feature

that impels this construction process against the passive acquisition one. Consequently, the acquisition of knowledge is linked to the presentation of merely the digital collection of the museum, while the construction of the knowledge is rooted on the presence of any educational resource on the website.

Table 10
Variables of the section of educational resources and relation to constructs.

Acquisition of knowledge	***Construction of knowledge***
- Digital collection	- Educational resources o Schedule and contact information o Publications o Downloadable in-situ activities o Virtual activities o Edutainment activities

All these variables and their consequent distribution according to the belonging construct can be translated into the theoretical model of the research, giving as a result the following operative empirical model for the analysis of the philosophy of web communication by museums.

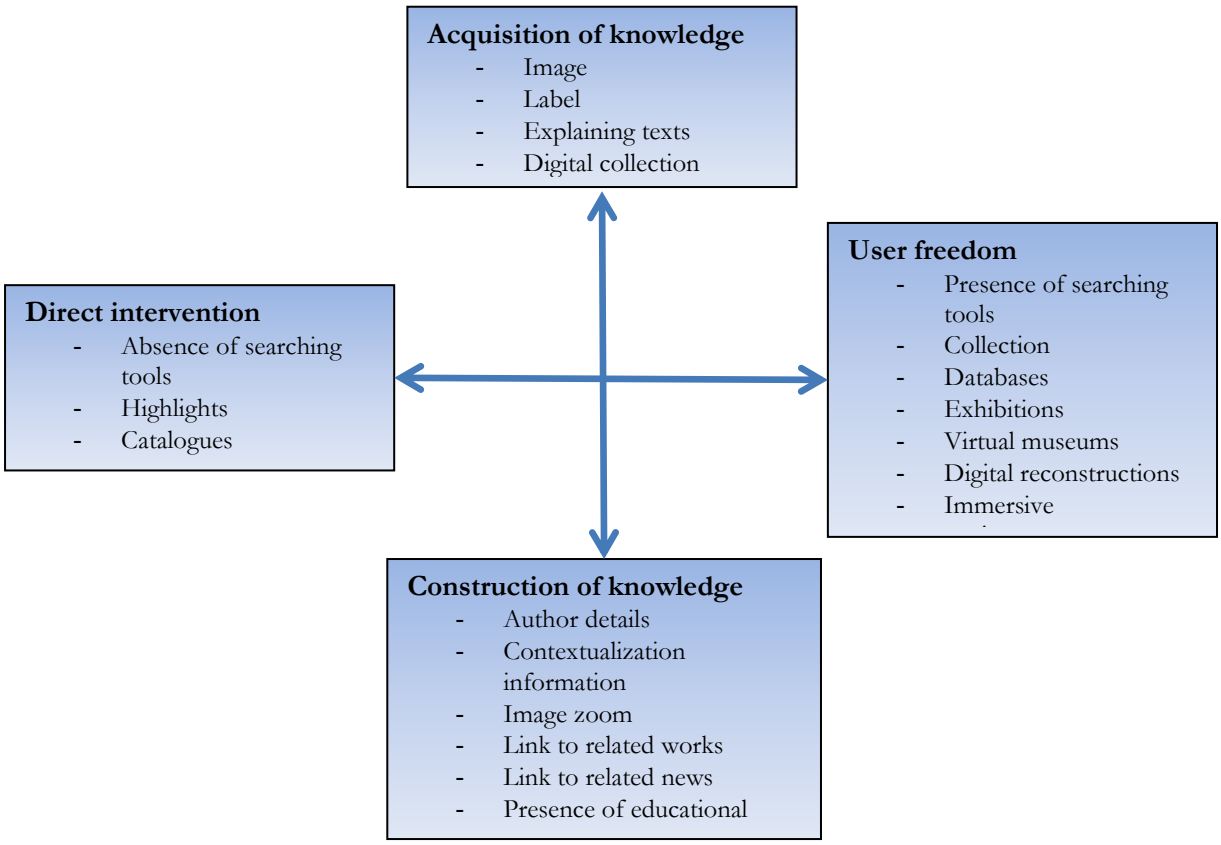


Figure 10: Empirical model of the philosophy of communication of the museums. Source: own elaboration.

As mentioned at the beginning of this section, the analysis of all these variables will be used to identify the intersection of the two driving axes of the web philosophy of communication of museums. This intersection will be the feature that identifies the quadrant to which each institution belongs on the theoretical model of the research.

3.2.1.1.- Empirical model of the profiling of the digital museum visitors

The other part of the research, equally, is based on the construct of different patterns of digital audiences' behaviour of the web technologies with cultural contents. In practice, these behavioural patterns are recorded on the logs of each user. Through the quantitative information recorded on the logs and further translated into visitors' reports, the research will carry out a twofold analysis, taking into account the users of a website as a global whole firstly and individually later. Due to the impossibility of physically identifying the virtual users of the websites, this research will not be able to deal with one extremely important aspect, namely the motivation for the use of the web resources of the museums. As a consequence, during the analysis of the weblog statistics of the three chosen museums[36], the research has defined some key terms [Jansen and Spink, 2000; Spink, Jansen and Ozmultu, 2000].

A *visit* is considered as the process of browsing a website defined by a concrete period of time, that is, from the moment the user enters the first page of the website until the moment he or she leaves it. If the user does not perform any action within a time lapse of thirty minutes, the visit will be considered finished. In this section of the research, a visit is assimilated to a visitor and these two words are considered synonymous.

A *unique IP* is the identification that can be tracked. Every computer is identified by an IP, which remains the same during each visit to the website. If this IP is a fixed one, it will remain the same even if the visitor accesses the page again at a later instance. The research assumes that in most cases a unique IP refers to the same visitor, as there is no way of distinguishing if, for example, a different member of the same family is visiting the museum website from their home computer, or if different students are using the same computer in a university or school computer lab. Another difficulty is that some computers do not have a fixed IP, but change it every time they log into the Internet. In this case, one

[36] See explanation of the choice in section "3.2.3.- Sample definition of the present research".

visitor can have different IPs and subsequently will be counted as different visitors. It has not been possible to solve these problems, but the analysis assumes that they did not change drastically the results.

The *duration* is the defined period of time of each visit and is represented in this paper in seconds.

The *number of pages* is the total amount of pages visited during all the visits to the website.

And, finally, the *number of pages per visit* is the mean of visited pages during each one of the visits.

Consequently, when analysing users as a global entity, the research has identified the following operative variables: visit, unique IP, duration, number of pages and number of pages per visit. The combination of these features will identify different patterns of behaviour of the users.

During the analysis of the weblogs of the database of the Pitt Rivers Museum, some other additional more specific terms were used. The research has identified the different users using the unique IP, as well as the country of origin and the type of user[37].

Regarding the classification by *type of user*, the research has delimited different broad and generic profiles, which identified them as private visitors, museums, universities or superior education centres and governmental or public institutions, among others. All these generic tags were applied, except for the case of Oxford University, whose direct relation to the museum could somehow determine a more specific pattern of use of the resources.

A *visit* is considered as the concrete period of time in which a user browses or searches within the website.

As the recording program of the Pitt Rivers Museum does not record the exit time, the research will deal with the *minimum session duration*. This duration will be delimited from the

[37] The identification of the IP addresses has been made using the website *IP-address.com - IP Tracer and IP Locator*: http://www.ip-adress.com/whois/ (last accessed 2010-11-27). Due to privacy issues, only generic data was gathered, such as country of origin or type of visitor.

entry moment until the last recorded action. As the duration of the last action cannot be delimited, the beginning of this one will be considered as the final of the minimum duration session.

Equally, the research has analysed the *access*, the *opening of a database*, the *searching*, the *navigation between records*, the *direct search of a record* and the *type of view of the results*. All these categories have been analysed with different perspectives, namely the frequency of the option, the total number, the repetition either in the same session or in different ones and in all the categories, except for the access one, the used database and the type of the option.

The *access* option addresses the accessing of the website of the database of the Pitt Rivers Museum.

The *opening of a database* refers to database opened, namely the objects or the photographs one.

The *searching* relates to the possibility of searching specific objects within the databases. If the obtained result is not the appropriate one, users have the possibility of *navigating between different records* obtained by the search.

If the user knows the exact desired record, however, the database also allows its *direct search* by different terms.

Finally, once the desired content is accessed, it can be consulted through diverse templates, that have been identified on the different *type of view* of the results.

Accordingly, the analysis of individual users has identified the following working variables: unique IP, country of origin, type of user, visit, minimum session duration, access, opening of a database, searching, navigation between records, direct search of a record and type of view of the results. The combination of all these features, once again, identifies different patterns of behaviour of users.

Table 11
Variables of the section of weblogs analysis and relation to behavioural patterns.

Behavioural patterns of users
- Visit
- Unique IP
- Duration of the visit
- Number of pages
- Number of pages per visit.
- Country of origin
- Type of user
- Minimum session duration
- Access
- Opening of a database
- Searching
- Navigation between records
- Direct search of a record
- Type of view of the results

All these sections together will be the ones answering to the research questions regarding the implementation and use of web technologies for the communication of digital collections of museums.

The present research hinges on the different constructs identified from the adopted theoretical frameworks. Within this framework, the research will carry out two interrelated analyses. The first one deals with the philosophy of communication and the constructs of institutional intervention, user freedom, acquisition of knowledge and construction of knowledge. In order to better analyse these constructs, four differentiated sections have been identified. These sections are the presentation of the holding, the searching option, the presentation of the contents and, finally, the educational resources. But these broad sections have, similarly, been translated into operative variables related to the constructs as follows:

- *Presentation of the holdings*: highlights, collection, catalogue, database, exhibition, virtual museum, digital reconstruction, immersive environments and other.
- *Searching option*: none searching tool, simple searching tool, advanced searching tool, complex searching tool and combined searching tool.
- *Presentation of the content*: image, labels, explaining text, creator details, contextualization, image zoom, link to related works, link to related news and other.
- *Educational resources*: schedule and contact, publication, downloadable in-situ activities, virtual activities, edutainment activities and other.

When dealing with the behaviour of the users regarding the digital resources of museums, the research has identified different variables to deal with the patterns of behaviour of global and individual users. Even though some of the variables are common to both kinds of analyses, the individual one requires more specific variables. Thus, the operative variables to analyse the behaviour of users are the following ones:

- *Global analysis*: visit, unique IP, duration, number of pages and number of pages per visit.
- *Individual analysis*: unique IP, country of origin, type of user, visit, minimum session duration, access, opening of a database, searching, navigation between records, direct search of a record and type of view of the results.

3.2.2.- Structure of the empirical research

According to the previously explained two fields of analysis and two theoretical constructs, the research has been structured on two main sections. The first one is the analysis of the institutional websites of the museums and the other one is the weblog analysis.

3.2.2.1.- Museums' institutional websites analysis structure

The first part of the analysis attempts to identify different models of application of web technologies by museums. In order to fulfil this task, the research has designed an evaluation template[38]. This evaluation has been carried out manually on all the websites contained on the Virtual Library of Museums (VLM) of the ICOM from the selected

[38] See Annex 2 for the template.

countries[39]. However, some of the websites were disregarded due to the lack of suitable content for the evaluation or to the non-functioning of the site.

The template deals with five main areas of the institution and its website: the identification of the institution; the type of digital collection; the searching tool; the presentation of the content; and the existence of educational resources. The identification of the institution collects mainly the name of the museum, the type of museum, the actual address and the virtual one. This part of the research is purely informational in order to be able to further identify each museum, but it has not been statistically treated. When dealing with the type of digital collection, the template centres on the digitized objects presented on the website and the way they are delivered to the virtual visitor, whilst the searching tool deals with the existence of any searching tool, the way of searching and the character of the search. The presentation of the content, conversely, identifies the features of the presentation of the digital objects on the website. Finally, the educational resources section firstly spots the existence or absence of educational resources and then identifies the resources themselves.

After the recollection of all these data, results have been treated in order to identify some archetypical models of web technologies application by museums. This should answer the first two premises.

3.2.2.2.- Weblogs analysis

Finally, the last stage of the research deals with the analysis of the use of the websites and their digital contents by the end user. The interaction on a session of the user with the content presented on the Web is recorded in log files and can be analysed to better understand the content use of the virtual visitors [Jansen, 2006:408-409]. This phase of the research is based basically on the collaboration with the museums themselves, so that they provided the research team with the weblogs data in order to fulfil the identification of the patterns of behaviour of the users. Due to this collaboration, the last part of the research is centred on three specific museums, namely the Benaki Museum in Athens (Greece), the Pitt River Museum of the University of Oxford (United Kingdom) and the Diocesan and Regional Museum of Lleida (Spain)[40]. However, as this stage is bigger than the other ones, it embraces three different subsections: a general comparison of websites use; the whole

[39] For a deeper explanation of the sample of the research, see section "3.2.3.- Sample definition for the present research".
[40] The explanation of choosing these museums will be given later.

site analysis of the Pitt Rivers Museum; and the users' database use analysis on the Pitt Rivers Museum website.

1. General site comparison

The main aim of this part of the last stage is to answer the fourth premise about the behaviour of the users on different websites. To obtain a global vision of users' patterns of behaviour on the different websites, the analysis of the websites has dealt with data such as number of visits, unique IP, time, duration and visited pages. These data should not be seen in isolation, but as part of a whole process and that is why main patterns would be extracted from the data, mainly concerning periods of higher and lower activity, peaks and ascending or descending patterns. This data provides the research with a useful sight of the patterns of each museum website. But in order to acquire a more precise picture, the research has compared the individual analysis of the main sites of the three museums to identify features, compare them and classify the sites. This analysis helps to certify or refute the fourth premise of the research.

The process of analysing and comparing the patterns of the websites has not been exempt from problems, because some issues were out of reach of the research. Each organisation has set up the system to record weblogs in each own way, over which the researchers have no control. Each museum utilizes different programs to gather the information related to website use (the Benaki Museum used Stone Steps Webalizer 2.7.0.5; the Museum of Lleida, Advanced Web Statistics 6.6 and Webalizer 2.01; the Pitt Rivers Museum, 123 Log Analyser). The research team has only received the recorded data from the museums themselves at the end of the process. This presents some difficulties at analysing and comparing the data, because in some cases there has been a lack of information or differences in the way they were recorded.

2. Whole site analysis of PRM

Once carried out the comparison of the main sites of the three museums, a more in-depth analysis takes place on the whole website of the Pitt Rivers Museum. This website has some specificities, because it embraces different sections. Apart from the main section, similar to many other websites, the Pitt Rivers has some subsidiary sites related to concrete projects and a database with the index cards of the institution. Following the same structure as the one used for the section before, the research has performed a comparison

of the three parts of the website in order to identify similarities or divergences among them.

Similarly, during this part of the research a first approach to the analysis of the patterns on the use of the databases of this website took place, analysing access, search, navigation and direct searches on them. This research allows identifying clearer initial models of users so that they could be used on the last step of the research.

3. Users database analysis

The final task of the research has been, probably, the most complex one, because it deals with the individual behaviour of the users on the databases of the Pitt Rivers Museum's website. In order to do this, the research focuses exclusively on visitors to the database of the Pitt Rivers Museum. This selection has been made due to data availability, but also based on the presupposition that a more specialized and targeted feature, such as the database of an anthropology museum, will have a more homogeneous audience. Because of the huge amount of visitors to the databases, the research has selected some of the IP addresses[41] to be analysed in-depth. Thanks to the profusion of data available from the Pitt Rivers, this section has isolated the selected IP addresses and identified many aspects, such as number and frequency of access, number and frequency of searches, databases searched, number and frequency of navigation between records or number and frequency of direct searches, among others. Due to the delimitation of the cases, the research has identified clearer patterns and paths of the virtual visits. This part of the research has been useful to test the last premise.

Once performed all these stages of the research, a clearer picture of the technological application by museums and their use by the virtual visitors has been obtained. This picture allows to highlight some important aspects and to formulate some conclusions for future implementations. These recommendations will help to better meet the needs and expectations of the virtual visitors of the museums digital sphere.

[41] The reasons of choosing the IP will be explained afterwards on the section of the analysis of the data and the findings.

The present research is divided into two main sections according to the two theoretical constructs: the website analysis of the museums and the analysis of the weblogs of the users to some museums' websites. The weblogs section, similarly, has been divided into other three minor sections, which deal with different but intertwined issues. The integration and triangulation of the results obtained from each section will provide a more accurate overview of the implementation of web technologies by museums and their use by virtual visitors. Consequently, the structure of the research will be the following one:

- Museums' institutional website analysis.
- Users' weblogs analysis.
    - Global analysis and comparison of the selected cases.
    - Global analysis of the Pitt Rivers site.
    - Individual analysis of users of the database of the Pitt Rivers Museum.

3.2.3.- Sample definition for the present research

As stated above, the first step taken during the research has been to identify the different models of presentation of museum collections and digital catalogues. During this stage the research has defined some theoretical models based on a practical evaluation supported by the previous literature review.

For the definition of the sample for the analysis the Virtual Library of Museums (VLM) of ICOM (http://icom.museum/vlmp) has been used. This website was created and is still maintained by Prof. Jonathan Bowen, helped by Prof. John Burke of the Oakland Museum of California for the USA section of the site. A few years after its initial creation, ICOM started to support the site. The VLM links to the websites of museums all over the world. The entries that appear on VLM are sent voluntarily by the museum staff filling one simple web form, with slight variations according to the origin of the institution.

Because of linguistic constraints and time limitations, the museums analysed at the first stage have been from Spain, the United Kingdom, Germany, Greece and the USA. In the four first cases, the museums analysed have been all the ones that appear in the VLM list. In the case of the USA, however, because of the large number of museums, the analysis centres on art and history museums. The total amount of museum websites analysed is 1921 and it can be divided as follows: USA 955, United Kingdom 518, Germany 299, Spain 138 and Greece 11[42].

[42] The low number of Greek museums can be explained by the fact that one of the Greek websites analysed belongs to the Hellenic Ministry of Culture (http://odysseus.culture.gr/). This is a portal embracing all the public museums and archaeological sites of Greece, as well as some private collections. Within the portal,

The analysis of all these websites was done between the 14th of January of 2008 and the 24th of February of 2008. On a first approach, many of the museums have been disregarded for further analysis, because 1) the website did not work or was under construction; or 2) the website did not fulfil the minimum requirements for the analysis. For a more accurate analysis, the study has considered as online digital collections only those presenting at least some highlights of the collection with some minimum data about them. For example, those websites which only have a paragraph describing the collection or some simple photographs of it were not included in the analysis. In the end, the sample studied consists of 219 entries.

Table 12
VLM websites listed at the Virtual Library of Museums site examined and percentage of those presenting some kind of online collection.

	Number of websites listed at the VLM	**Websites with online collections**	**%**
USA	955	110	11,5%
United Kingdom	518	56	10,8%
Germany	299	20	6,7%
Spain	138	31	22,5%
Greece	11	2	18,2%
Total	1921	219	11,4%

The final stage of the research deals with the analysis of the weblogs of virtual users of museums websites during the year 2008. These weblogs contain information about each visit and visitor to the website of the institution and, in that sense, offer the benefit of a complete sample.

After contacting via email the relevant staff from the museum identified on the second group of the website classification asking them to collaborate with the research in the next stage of weblog analysis, the following three case studies from those who responded have been selected: the Benaki Museum (Athens, Greece), the Diocesan and Regional Museum of Lleida (Lleida, Spain)[43] and the Pitt Rivers Museum (Oxford, United Kingdom). The weblog information was kindly provided by the relevant staff at each museum. Choosing

every museum has its own site, but the collection of all of them is presented jointly. In order to avoid distortions on the percentages, this portal with all its museums has been treated as one entry.

[43] The weblogs of the Diocesan and Regional Museum of Lleida were provided by the researchers of the Òliba Group of the Open University of Catalonia (Barcelona, Spain), institution that maintains the server of the Museum's website.

these museums has not been made by chance, because in fact, apart from the obvious requirement of data availability, there is another underlying empirical principle. The three websites fulfil the previous requirements of presenting at least some kind of their holdings through their site, but the three of them have some different characteristics in order to be able to prove the fourth premise. The Pitt Rivers Museum is mainly research-oriented and, because of that, its database has a more targeted character. Its audience volume is quite big, but the research assumes that it is more or less specialized on the presented topics. The Diocesan and Regional Museum of Lleida, in contrast, is a smaller institution, which presents a more general topic and which is oriented to the broad audience. Its website may help to analyse the behaviour of the general public. Finally, the third chosen institution, namely the Benaki Museum, lays midway between the previous two websites and institutions. It mainly has a general audience-oriented character, but its website also comprises some more specialized features, such as the database with the holdings of the institution. This midway position allows the research to carry out a comparison with the other two institutions on the process of validating or refuting the fourth premise. As can be seen, choosing the institutions not only lays on the data availability, but also on a more pragmatic basis in order to successfully fulfil its tasks.

In the cases of the Benaki Museum and the Diocesan and Regional Museum of Lleida, results deal with the whole website. In the case of the Pitt Rivers Museum, however, results from the initial stage are related to the main site of the museum and do not include the database (identified as a subsidiary site) or the different projects or resources of the website. The analysis of the latter ones has been carried out in the subsequent stages and results are presented separately.

The three selected museums have their own particular characteristics, which are very briefly presented here. The Pitt Rivers Museum is part of the University of Oxford and is closely related to the anthropological research carried out at the University. From its foundation in 1884 based on the nucleus of Lieutenant-General Pitt Rivers' collection, until today, the Museum still maintains a research-oriented philosophy.

The Benaki Museum is the oldest and largest museum in Greece operating as a Foundation under Private Law. Its nucleus was the extensive collections housed at the private neoclassical mansion of Antonis Benakis, scion of one of the leading families of the Greek

Diaspora in Alexandria, which were donated to the Greek state together with the building in 1931. It embraces an extensive collection of Greek artefacts from the prehistoric to the current period, and also Coptic, Chinese, Pre-Columbian art, and is spread over different buildings around Athens, following the satellite concept of decentralized services.

The Diocesan and Regional Museum of Lleida is located in Lleida, a medium-sized rural provincial capital in the north of Spain. The region where it is located is famous because of its Romanesque tradition and heritage. The museum was founded in 1997 in the form of an institutional consortium of regional (Generalitat of Catalunya), provincial (Council of Lleida) and local authorities (City council of Lleida and County council of Segrià), as well as the Diocese of Lleida. It holds the diocesan collection and the archives of the old Diocesan Museum of Lleida.

The present research has delimited the sample for the analysis according to the Virtual Library of Museums of the ICOM. Due to time and language constraints, only listed museums from Germany, Greece, Spain, the United Kingdom and the USA have been analysed. The websites not fulfilling the minimum requirements have been disregarded and in the end the sample consisted of 219 entries for the first part of the research.

The section dealing with the weblogs of the users, however, has been restricted to three museums, namely the Benaki Museum, the Diocesan and Regional Museum of Lleida and the Pitt Rivers Museum. The comparison of the three websites has been done identifying the users as a global entity. When analysing users individually, however, only the Pitt Rivers Museum has been selected, due to the availability of data and the suitability of the website itself.

3.2.4.- Analytical methods of the research

In order to successfully achieve an accurate overview of the web technologies implementation by museums and their real utilization by end users, different analytical methods have been applied during the research. Moreover, the analysis of the specific sections is determined by the used methods.

3.2.4.1.- Website analysis

Using the template designed for the website analysis, quantitative data have been gathered about the institutional websites of the museums and their different technological features. The first step with these data has been the frequencies' analysis of each feature in order to acquire a precise picture of the panorama. Additionally, cross tabulation methods have

been carried out within the categories of each section to understand the degree of correlation between the different variables of the same feature. This method has been applied to the sections of searching, presentation of the collection, presentation of the contents and educational resources separately. Similarly, all the items of the diverse sections have been treated to create cross tabulation tables to also better understand the relation among the different sections and their features. Apart from the linear relations between the features, the research takes into account the multiple relations among them, which will be expressed through diverse association rules. This analysis identifies the relation of some antecedent features with the presence of a specific consequent one on the website.

Furthermore, these different analytical methods have also been applied in a second stage taking into account the differences by country of origin and the type of institution analysed. In other words, once the general frequencies and cross tabulations are analysed, the same procedure will be applied to the different institutions, but dividing them on the one hand by country of origin and on the other by type of institution. This analysis helps to delimitate differences on the implementation of web technologies by different countries and institutions in order to answer to the second and third premises.

After this descriptive analysis, the research carries out a clustering process of the websites. The cluster analysis of the institutions has identified the different groups of archetypical implementation of web technologies. Once again, a frequencies and cross tabulation analysis have been carried out with the identified groups. Additionally, the research performs a factorial and an ANOVA analysis in order to highlight existing factors for the correlation within the groups of observed variables. With these analytical methods, the research tests the first premise about the different archetypical implementation models of web technologies by museums.

All these statistical analyses have been supported by the use of the statistical software SPSS Statistics 17.0 and SPSS PASW Modeler 14.0.

3.2.4.2.- Users' weblogs analysis

The weblog analysis presents two interrelated but slightly different sections. Consequently, the analytical methods applied on each one also differ. In all the cases, the institutions provided processed data and in many cases the final reports of the activity of the site

during the stipulated time period. These data and reports have been used to perform a descriptive job of the different analysed features based on the frequencies and the means of every variable and, subsequently, to carry out a comparison among the diverse websites in order to identify patterns of use among them. The data for all the selected months help creating a pattern of the use of the digital resources of museums by the virtual visitors. In principle, most of the provided data was given in absolute numbers, but the great difference in the way these were recorded among the institutions make it almost impossible to compare them. In order to be able to carry out an accurate comparison of the patterns in all three museums, these data have been converted to a percentage index. The biggest value of each category will be considered as 100 and all the remaining ones will be converted according to this percentage. This process of harmonization of the absolute values is completely valuable to identify and delimit specific patterns not only among the different features of the same website, but also among the sites of the three different institutions. Consequently, this part of the analysis evaluates the validity of the first part of the fourth premise of the research.

When dealing with the more specific use of the database of the Pitt Rivers Museum by the virtual visitors, however, the analysis has been more profound and varied. Apart from a frequencies and means analysis, the research has applied a cross tabulation with the categorical variables that identify the generic use of the different options of the database. Similarly, a lineal regression model analysis has been applied to the ordinal variables of the research in order to identify potential relations among them.

After this analysis, the research has carried out a clustering process of the different users. The cluster analysis of the virtual visitors identified the different groups of behaviour at the time of accessing the cultural contents of the database. Once again, a frequencies and cross tabulation analysis has been carried out with the identified groups. Additionally, the research performs a factorial and an ANOVA analysis in order to highlight existing factors for the correlation within the groups of observed variables.

Finally, in order to be able to delimit precise patterns of use of the database of the Pitt Rivers Museum, some IP addresses have been chosen and their current behaviour on the database identified. A complete description of all the actions carried out by the virtual users has been performed, including, in the applicable cases, the different visits to the database

and potential repeating patterns. As the research has previously identified some clusters of users, the criteria to choose the IP addresses will be based on these groups. Ten IP addresses from each group will be selected and analysed in depth.

All these statistical analyses have been supported by the use of the statistical software SPSS Statistics 17.0 and SPSS PASW Modeler 14.0. The identification of the basic characteristics of each IP has been done using the IP recognition site *IP-address.com - IP Tracer and IP Locator*[44]. All these analytical methods will be useful to identify and delimit different patterns of use of the visitors within the database of the Pitt Rivers Museum and, consequently, to test the last hypothesis.

The different stages of the research require different analytical methods. All the applied methods are quantitative one and range from a general frequencies' analysis in all the cases to more complex cluster analysis. Anyhow, the integration of the results obtained from the application of all these different methods will be valuable to acquire a complete picture of the implementation of web technologies by museums and of their real utilization by the final users of the institutions. This picture will be useful for further implementations of web technologies by cultural institutions to better fulfil the needs and expectations of their users.

3.2.5.- Limitations of the study

The present research has some limitations due both to some external factors as well as to some characteristics of the structure of the data.

First of all, on the delimitation of the sample for the first stage of the research, there are some constraints. The first delimitation of the sample has been done according to time availability and language criteria. As the websites have to be analysed in depth, the original content has to be the accessed one and not the translated parts. For this reason, only museums with the original content in English, German, Greek or Spanish have been initially selected. But, due to time constraints, the sample has been delimited again lo museums from Germany, Greece, Spain, the United Kingdom and the United States of America. In the case of the USA, moreover, because of the overwhelming amount of institutions, only art and history museums have been selected from the whole American sample. Consequently, the sample of this research is not a universal, but a more limited one.

[44] *IP-address.com - IP Tracer and IP Locator*: http://www.ip-adress.com/whois/ (last accessed 2010-11-27).

Similarly, due to the previous reasons, the delimitation of the sample embraces only museums from western societies and cultures. Different countries are represented on the sample and even different geographical regions, namely the Mediterranean area, Northern Europe and America. These countries and regions have different cultural backgrounds or, in other words, the sample comprises museums from the Anglo-Saxon, Germanic, Greek and Latin backgrounds. All of them, however, are embedded into the more generic framework of the Western culture. Other cultural frameworks, anyhow, may not share the same philosophical and mental conceptions of time, space, memory, culture and identify. Therefore, cultures that do not share the philosophical schemes of Western culture may have different conceptions of the museums. So, the philosophies of communication of institutions from this limited sample are not per se universal, but limited to the analysed areas. It should be continuously bear in mind that the displayed distribution of philosophies of communication represents a distribution of this sample. Further extrapolation of the results of this research to a more global sample should be done with extreme caution.

Finally, there is another limitation related to the sample identification, due to the use of the Virtual Library of Museums of the ICOM. Museums listed on this website are included voluntarily by the staff of the own institution. Due to this voluntary character, institutions that opt for the digital choice of not being part of the digital sphere are, logically, not included in the Virtual Library of Museums. Moreover, even some institutions with working websites do not appear on the list[45]. Anyway, after the consideration of other options for the identification of the institutions, such as the search on the Internet, the research has selected the delimitation of the sample according to the list of the Virtual Library of Museums. Taking into consideration this fact, the present research has considered this list the most feasible way to compile the most comprehensive amount of museums on the web.

For the stage of the analysis of the global use of the resources by the virtual visitors, there is another limitation, because weblogs have to be provided by the own institution. After contacting many of the institutions analysed on the first stage for further collaboration, the

[45] This is the case of the Diocesan and Regional Museum of Lleida that, at the time of analysis was not listed on the Virtual Library of Museums and, consequently, not included in the sample for the first stage of the research.

rate of responses has been quite low. Additionally, from the received answers, the degree of willingness of the institutions to collaborate on further stages has been low. Consequently, the research has selected three institutions that kindly provided the information of the weblogs for this stage of the research.

Related to the previous aspect, another limitation has been the non-availability of the primary source of information for the weblogs analysis. Once data has been processed, reports show static information that has a purely descriptive character. Similarly, the reasons for the information gaps cannot be identified from the reports.

Additionally, since not all the IP addresses and exact paths are explicitly identified on the reports, it has not been possible to follow any IP address through the whole website of any institution.

It also should be pointed out that there is no efficient way to relate IP addresses with visitors, representing a concern common to all the researches on users of a website. Even though it is commonly assumed that a unique IP address corresponds to a single visitor for the feasibility of the analysis, this assumption does not consider different users accessing from the computer or the same visitor accessing from different places. For the stage of the analysis of the users of the database of this research, the assimilation of an IP address with a single visitor has been adopted due to the impossibility to ensure if an IP address represents a single visitor and if a visitor utilizes a single IP address to access the database.

The last limitation, which transformed some of the initial aims of the research, is the impossibility of linking IP addresses with real life users and the consequent impossibility to assess motivations, expectations or objectives of virtual visitors when using digital resources of cultural institutions.

Apart from these limitations, the sample and data of the research are consistent and optimal for the analyses designed for this specific research.

The present research embraces some limitations related to time and linguistics constraints, extension of the sample, low degree of willingness to collaborate in further stages by cultural institutions, the rigidness of the processed reports on the weblogs of the websites, as well as the relation of IP addresses and visitors. Furthermore, the impossibility to link IP addresses with real life users does not allow analysing motivations and expectations to use digital resources.

Section 4.- Findings of the research

4.1.- Museums' websites analysis

The first part of the research deals with museums' institutional websites. The aim of this part of the analysis is to identify the real use of technological applications on museums websites related to the collections and holdings of the institutions.

The first conclusion obtained from this analysis is that globally only one out of ten museums websites can be characterized as something more than a mere electronic leaflet of the institution itself. The percentage of Germany is lower than the mean, but the Spanish one is significantly higher than the rest. In fact, one out of five museums websites in Spain present its collection or some highlights of it.

These selected websites will be the ones used to answer the two first premises of the research. Namely,

- Premise α': Different archetypical technological implementation models relate to different philosophies of communication.
- Premise β': Different national cultural values and corporate values moderate the philosophy of communication of the institution.

The chapter explains the results of the analyses performed in order to answer the mentioned premises. Results display precise descriptive statistics of the used variables in the study. They also report on the conducted association rules analysis. Moreover, results from the cluster and factorial analyses are being presented in this chapter.

4.1.1.- Institutional profile

First of all, it is essential to identify the subjects of the research. As mentioned before, the selected museums come from Germany (20), Greece (2), Spain (31), the United Kingdom (56) and the United States (110). Consequently, three fourths of the analysed museums' websites come from an Anglo-Saxon country, one out of ten from a German culture and fifteen per cent from a Mediterranean country. This differentiation is important to observe in order to identify if, when analysed by country, the traditional cultural groupings play any role on the conception and development of technological applications on each museums website.

Table 13
Number of museums per country and percentage of the total.

Country	**N**	**%**
Germany	20	9.1
Greece	2	0.9
Spain	31	14.2
United Kingdom	56	25.6
United States	110	50.2
Total	**219**	**100.0**

On the other hand, in order to be able to answer to the third premise, the research has identified the nature of the institution. The adopted categories are not random ones, but based on the division made on the VLM of the ICOM. Clearly, art museums are an overwhelming majority, because they represent nearly eight tenths of the whole sample. On the second place, the following group of museums in terms of number is the one composed by history museums, but it is really far away from the percentage of the art museums, because they only represent less than seven out of a hundred. It is remarkable that the institutions identified with the tag *others* represent nearly a tenth of the sample. Among those institutions the research has classified science museums, natural history museums or unclassifiable institutions.

Table 14
Number of museums per type of institution and percentage of the total.

Type of institution	**N**	**%**
Art museum	172	78.5
History museum	15	6.8
Anthropology museum	4	1.8
Archaeology museum	6	2.7
Cultural site	2	0.9
Other	20	9.1
Total	**219**	**100.0**

Finally, regarding the general profile of the institution, the research has dealt with the identification of the type digital resources presented on each website. Before analysing the websites, the research has identified two different types of digital resources. First of all, there are the so called digital collections that are nothing more than the digital representation of the actual holdings of the institution. Secondly, the research has identified as educational resources all the digital resources with a clear educational purpose. As mentioned before, these resources range from the mere contact and schedule of the pedagogical or education department to more complex and complete virtual or edutainment activities. The third option is to have a combination of both options on the website. Obviously, all the entries have at least one the above mentioned, because otherwise they would have been disregarded from the analysis. Three out of four museums have both digital collections and educational resources on their websites, while only a fourth presents merely the digital collection. None of the institutions presents only educational resources.

Table 15
Number of museums per type of digital resources on the website and percentage of the total.

Type of digital resource	**N**	**%**
Digital collection	49	22.4
Educational resources	0	0.0
Both	170	77.6
Total	**219**	**100.0**

Apart from the previous facts, there is another distinctive aspect among the selected websites. Every museum has a different type of collection and, consequently, the digitized objects vary greatly. The research has identified different categories of objects that can be combined. Namely, paintings, manuscripts, photographs, sculptures, decorative arts or jewellery, ritual or religious objects, daily life objects, magazines or books and others. The presence of any of the sorts does not automatically mean the exclusion of any other. In

fact, in this sample, the most common feature is the combination of two or more types of objects. The most common type of digitized objects is the paintings, since more than 85.0 per cent of the sample present some of them on their websites. The presence of digitized sculptures is also very important, because more than three fourths websites present their sculptural holdings electronically. From the rest of the options, only photographs are present in more than the half of the websites, while little more than one out of ten sites have electronic versions of their magazines or books.

Table 16
Number of museums per digitized objects and percentage of the total.

Digitized objects	**N**	**%**
Paintings	190	86.8
Manuscripts	48	21.9
Photographs	113	51.6
Sculptures	170	77.6
Decorative arts, jewellery	98	44.7
Ritual or religious objects	53	24.2
Daily life objects	56	25.6
Magazines, books	29	13.2
Others	44	20.1

As mentioned before, the combination of all these kind of digitized objects is the most common feature. When analysed all the combinations present on the selected websites, the results show that, as could be expected from the high number of museum presenting their paintings and sculptures electronically, the highest rate of combination takes place between those two types of holdings. In fact, more than seven out of ten websites combine both digitized paintings and sculptures. From the rest of combinations, the most remarkable ones are the one of paintings and photographs, the sculpture-photographs one, the one the combines sculptures and decorative arts or jewellery and the one the combines the latter with paintings, in descending order. All these combinations range from below fifty to around forty per cent. Analysing the rest of possible combinations, they do not reach a presence of one fourth on the selected websites and many of them not even a tenth.

Table 17
Contingency table of the digitized objects in frequency and percentage of the total.

		N of total Paintings	Manuscr.	Photogr.	Sculpt.	Dec. arts, jewel.	Rit./relig. obj.	Daily life obj.	Mag., books	Others
% of total	**Paintings**	---	40	102	158	85	42	41	23	34
	Manuscr.	18.3	---	29	34	32	21	24	22	16
	Photogr.	46.6	13.2	---	96	54	29	32	22	35
	Sculpt.	72.1	15.5	43.8	---	90	50	44	16	30
	Dec. arts, jewel.	38.8	14.6	24.7	41.1	---	47	44	15	16
	Rit./relig. obj.	19.2	9.6	13.2	22.8	21.5	---	37	11	7
	Daily life obj.	18.7	11.0	14.6	20.1	20.1	16.9	---	16	12
	Mag., books	10.5	10.0	10.0	7.3	6.8	5.0	7.3	---	14
	Others	15.5	7.3	16.0	13.7	7.3	3.2	5.5	6.4	---

When taking a deeper look at the combination of types of digitized objects, it can be clearly identified that, for any other sort of objects, its combination with digitized paintings is nearly always above three quarters for their total, reaching sometimes values above ninety per cent of the cases. Almost the same phenomenon can be observed when analysing the sculptures rate. However, in this case values descend below seventy per cent if sculptures are crossed with magazines or books or other kinds of objects. But looking at it the other way around, except from the combination of both types, for digitized paintings and sculptures the combination with other kind of digitized objects rarely exceed values above three out of ten. An exception can be made with the combination with decorative arts and jewellery, because they also represent more than half of the total of websites with digitized sculptures and more than two fifths of websites with digitized paintings.

Apart from these main patterns, there can be distinguished some other strong relationships among digitized objects, such as the ones of digitized sculptures containing websites also accounting more than nine out of ten of total decorative arts or jewellery and ritual or religious objects representing websites, as well as more than eight out of ten of total photograph showing websites A quite similar value can be identified if analysing the representation of sculptures and digitized ritual and religious objects among websites that digitally display their daily life objects holdings. In fact, the relationship of digitized objects within the categories of ritual or religious objects and daily life objects in both directions represents more than two thirds of the total. It is important to remark that more than three out of four websites with digitized magazines or books embrace digital versions of manuscripts. It could be also underlined the fact that, among websites with digitized

manuscripts, seven out of ten also exhibit digitized sculptures and two thirds decorative arts or jewellery. Regarding the rest of combinations, at most they reach values a little above half of the total, but in most of the cases they do rarely exceed a third of the total of websites representing a determined type of digitized objects.

Table 18
Contingency table of the digitized objects in percentage of the total of digitized objects per row.

	Paintings	**Manuscr.**	**Photogr.**	**Sculpt.**	**Dec. arts, jewel.**	**Rit./relig. obj.**	**Daily life obj.**	**Mag., books**	**Others**
Paintings	---	21.1	53.7	83.2	44.7	22.1	21.6	12.1	17.9
Manuscr.	83.3	---	60.4	70.8	66.7	43.8	50.0	45.8	33.3
Photogr.	90.3	25.7	---	85.0	47.8	25.7	28.3	19.5	31.0
Sculpt.	92.9	20.0	25.7	---	52.9	29.4	25.9	9.4	17.6
Dec. arts, jewel.	86.7	32.7	20.0	91.8	---	48.0	44.9	15.3	16.3
Rit./relig. obj.	79.2	39.6	32.7	94.3	88.7	---	69.8	20.8	13.2
Daily life obj.	73.2	42.9	39.6	78.6	78.6	66.1	---	28.6	21.4
Mag., books	79.3	75.9	42.9	55.2	51.7	37.9	55.2	---	48.3
Others	77.3	36.4	75.9	68.2	36.4	15.9	27.3	31.8	---

Summing up, it can be said that the average profile of the analysed websites is of an art museum from an Anglo-Saxon country, that has both a digital collection and some educational resources and combines mainly displays of digitized paintings and sculptures and in a lower degree also of photographs and decorative arts or jewellery.

4.1.2.- Searching options

A very important aspect of museums websites for the research has been the presence or absence of any searching tool or engine. The searching tool has been characterized according to the degree of complexity, ranging from the total absence of searching tool to the presence of a complex one that requires a more specific or specialized knowledge of the subjects presented. After the identification of the searching tool, the research has looked at the mode of searching. That is, if the search can only be performed through textual queries or it can also be done through images.

Four out of ten institutional websites do not have any searching tool on their websites. However, more than the half of the websites present at least a simple searching tool for the content of the website. Among those who have a searching tool, three out of ten have a simple one-term tool. Regarding the more advanced option, only nine per cent of the

analysed websites with any searching tool present it, while only seven per cent have a complex searching tool that requires a deeper and specific knowledge. Anyway, the largest group is the one that combine some of the above mentioned options, because they represent more than the half of the websites with any searching tool.

Table 19
Number of museums by presence or absence and degree of the searching tool.

Searching tool – Degree	**N**	**%**
None	96	43.8
Any searching tool	123	56.1
Simple	*36*	*16.4*
Advanced	*11*	*5.0*
Complex	*9*	*4.1*
Combined	*67*	*30.6*
Total	**219**	**100.0**

Table 20
Percentage of degree of searching of the websites with any searching tool.

Searching tool - Degree	**% of those with any searching tool**
Simple	29.3
Advanced	8.9
Complex	7.3
Combined	54.5
Total	100.0

Taking a look at the mode of searching, nearly all the websites only have the possibility of searching by text queries. Only three museums have a combination of text and graphical search, while other four present any other type of searching mode. But as mentioned above, they represent a mere five per cent of the total of websites with any searching tool.

Table 21
Percentage of mode of searching of the websites with any searching tool.

Searching tool - Mode	**N**	**% of those with any searching tool**
Textual	116	94.3
Graphical	0	0.0
Combined	3	2.4
Other	4	3.3
Total	123	100.0

Summing up, more than half of the websites present some kind of text-based searching tool and they mainly combine more than one degree of deepness on the search.

4.1.3.- Digital collection

One of the main sections of the websites for this research has been the one presenting the digital collection of the institution itself. As digital collection the research has characterized three main features. On the one hand, there is an identification of the way the digital holdings as a whole are presented. There is a substantial difference between digital catalogues and databases, since the first one allows browsing, whilst the second one is more searching-oriented. Regarding these two options, digital catalogues have a higher presence, although neither of them reaches a percentage of the half. More than 47.0 per cent have some browsable digital catalogue on their websites, while slightly more than four out of ten have implemented some kind of databases with information regarding the contents of the institution.

When talking about the extent of the presented content, the research has differentiated two options. The first one of them presents merely some highlights of the holdings, selected by the institution's staff, and has presence on nearly two thirds of the analysed websites. Similarly, the option of consulting the whole or a great part of the institutional collections has been identified on six out of ten electronic sites.

Finally, the third part of this section deals with more advanced holdings presenting ways. All the options represent not a big percentage of the total websites amount, since the digital exhibitions are the most present ones with a presence on 16.0 per cent of the analysed websites. Virtual museums, on the other hand, do not even reach a presence of one out of ten websites. Reconstructions and immersive environments have only a testimonial and non-presence at all, respectively.

Table 22
Number of museums per digital collection option and percentage of the total.

Digital collection	**N**	**%**
Catalogues	104	47.5
Databases	90	41.1
Highlights	138	63.0
Collection	130	59.4
Exhibitions	35	16.0
Virtual museum	18	8.2
Reconstruction	1	0.5
Immersive environments	0	0.0
Other	4	1.8

Regarding the combination of these options, there is a quite big difference among the first two parts of the sections and the last one, namely the one dealing with more advanced content presenting options. The combination of these latter ones, due to their also really low overall presence, never reaches above one out of ten websites, except for the case of exhibitions and highlights, as well as exhibitions and collections. The combination of catalogues and databases is present on three out of ten websites and the one of highlights and the whole collection on more than a fourth of the total amount of websites. When looking at the highlights, their combination with catalogues is present in thirty per cent websites and with databases in a percentage slightly higher than a fifth of the total amount of analysed sites. Making the same analysis with the combination of collections with catalogues and databases, in both cases the presence is higher than one third of the institutional sites.

Leaving aside the percentage of the combinations regarding the overall amount, it is also important to distinguish the percentage of combinations taking into account only the total number of each option. In fact, while not even two thirds of the pages with a catalogue present also a database, nearly three fourths of the ones with a database have also implemented a catalogue. Regarding the combination of highlights and collections, conversely, they present a quite similar percentage in both cases, since in both directions it represents just more than two fifths of the total of the option. When analysing the presence of other options among the ones with highlights, catalogues have a higher presence than databases with nearly a half against a little bit more than a third. If dealing with highlights, however, these both options equal their amounts, since in the two cases the presence is a little higher than six out of ten websites. Nevertheless, if the analysis is done the other way round, differences are higher. In both cases highlights represent a lower percentage of presence than the whole collection among the total of catalogues and databases. Highlights are present on more than half of the pages with databases, but merely two thirds among those with some kind of digital catalogues. Regarding collections, however, the pattern is the contrary one, since the highest presence percentage takes place among sites with databases, with more than nine out of ten websites combining them. The combination with a digital collection takes place in more than three fourths of the sites with a digital catalogue. It is also meaningful that the difference between the combination with highlights and the one with digital collections is higher among sites with databases than among sites with catalogues. In fact, the latter one is of a fourteen per cent, while among museums'

sites with databases nearly reaches a forty per cent. Finally, it is also remarkable that more than a fifth of the sites with virtual exhibitions also have implemented a virtual version of the museum, while the percentage doubles if the relationship is analysed the other way round.

Table 23
Contingency table of the digital collection in frequency and percentage of the total.

		N of total Catal.	Datab.	Highlig.	Collect.	Exhib.	Virtual mus.	Reconstr.	Immer. envir.	Other
% of total	**Catal.**	---	66	66	81	18	10	0	0	0
	Datab.	30.1	---	49	82	17	10	1	0	0
	Highlig.	30.1	22.4	---	57	24	11	1	0	1
	Collect.	37.0	37.4	26.0	---	27	12	0	0	0
	Exhib.	8.2	7.8	11.0	12.3	---	8	0	0	0
	Virtual mus.	4.6	4.6	5.0	5.5	3.7	---	0	0	0
	Reconstr.	0.0	0.5	0.5	0.0	0.0	0.0	---	0	0
	Immer. envir.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	---	0
	Other	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	---

Table 24
Contingency table of the digital collection in percentage of the total of option per row.

	Catal.	Datab.	Highlig.	Collect.	Exhib.	Virtual mus.	Reconstr.	Immer. envir.	Other
Catal.	---	63.5	63.5	77.9	17.3	9.6	0.0	0.0	0.0
Datab.	73.3	---	54.4	91.1	18.9	11.1	1.1	0.0	0.0
Highlig.	47.8	35.5	---	41.3	17.4	8.0	0.7	0.0	0.7
Collect.	62.3	63.1	43.8	---	20.8	9.2	0.0	0.0	0.0
Exhib.	51.4	48.6	68.6	77.1	---	22.9	0.0	0.0	0.0
Virtual mus.	55.6	55.6	61.6	66.7	44.4	---	0.0	0.0	0.0
Reconstr.	0.0	100.0	100.0	0.0	0.0	0.0	---	0.0	0.0
Immer. envir.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	---	0.0
Other	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	---

Summing up, the main differing features of the websites regarding what has been defined as digital collection are the presence of catalogues and databases and the extent of the presented contents. In fact, the combinations of these four variables represent the highest percentages of the combination of elements on this section. The more advanced options of presenting the contents as a whole have a quite low degree of presence, since only digital exhibitions exceed a ten per cent and the virtual museum does not even reach this amount. Reconstructions and immersive environments are practically non-existent among the analysed websites. So, **selected institutional museums sites can be generally characterized as quite simple ones**.

4.1.4.- Presentation of the content

It may be said that this section deals with the most visual part of the research, because it analyses the way in which contents are presented to the users. Or in other words, how users see the information provided by the institution on the website. The research has identified that there are some features that are mere electronic replicas of the actual contents, such as the image or a label with brief facts about the presented content. Anyway, taking advantage of the possibilities provided by web technologies, there are other more specialized features, such as some contextualization, an image zoom, links to other related works or in depth author details, among others.

The first mentioned two items are the most prominent ones on the museums websites, because more than nine out of ten sites present their contents by images and label. The next feature in order of presence is the explaining text that accompanies the content in more than half of the analysed websites. Another feature that expands information about the content is the authors' details one, which is present in two out of five websites. Nearly one third of the analysed sites have implemented a zooming tool to observe in more detail the image. Among the rest of the features identified by the research, only the contextualization and links to related works have a remarkable percentage, though it only represents one site out of ten of the selected ones.

Table 25
Number of museums per type of presentation and percentage of the total.

Presentation of digital contents	**N**	**%**
Image	207	95.0
Label	199	91.3
Explaining text	114	52.3
Author details	87	39.9
Contextualization	22	10.1
Image zoom	70	32.1
Link related works	22	10.1
Link news	5	2.3
Other	9	4.1

Analysing the combination of the features to present the digital contents, the most present one combines images and labels, with a presence of more than 85.0 per cent in this sample. Secondly, the combination of some explaining text with either an image or a label takes place in around half of museum institutional sites. Author details are also combined in about two fifths of the cases with the above mentioned first two options, while less than a

third of the total has a combination of the image zoom with an image or a label. Similarly, more than a fourth of the websites present a combination of author details and explaining text and more than a fifth the one of an explaining text and a zooming option on the image. The combination of the image zoom and the author details is present in less than a fifth of the websites, while the rest of the possibilities do not represent a high percentage, with only the combinations of images or labels with either contextualization or links to some related works ranging around a tenth of the total amount of the websites.

Taking into account not the totality of the websites but of each option, there are two extreme positions. On the one hand, images and labels are present in more than nine tenths of each option, even reaching a hundred per cent in some cases. On the other, links to news related to the presented content or other kinds of presentation options rarely reach representative percentages, since they exceed a fifth of the total only when they are combined with links to related works or among them. Anyway, due to their overall low representativeness, their percentage should not be taken as significant. The presence of some explaining text takes place in more than a half of the rest of options, more than three fourths in the sites with some contextualization and four fifths in those with links to some related works. The pattern remains similar when taking into account the presence of author details in the rest of the options, although values decrease in all the cases about ten points. This pattern takes place again if analysing the image zoom option in comparison to the author details. In this case, however, the percentage of image zoom within the websites with links to related works remains high with more than seven out of ten cases. Among the rest of the combinations, the one of contextualization and links to related works is present in two fifths in both directions. Finally, the presence of links to other related works takes place in more than twenty per cent of the websites with any zooming option for the images. The rest of the combinations of contextualization and the links to related works range from one to two tenths of the overall amount of websites with any other option.

Table 26
Contingency table of the type of presentation in frequency and percentage of the total.

		N of total Image	Label	Expl. text	Author details	Context.	Image zoom	Link related works	Link news	Other
% of total	**Image**	---	189	111	85	21	70	22	5	7
	Label	86.7	---	107	87	22	69	22	5	8
	Expl. text	50.9	49.1	---	60	17	48	18	4	6
	Author details	39.0	39.9	27.5	---	14	41	16	4	5
	Context.	9.6	10.1	7.8	6.4	---	12	9	2	3
	Image zoom	32.1	31.7	22.0	18.8	5.5	---	16	5	6
	Link related works	10.1	10.1	8.3	7.3	4.1	7.3	---	5	5
	Link news	2.3	2.3	1.8	1.8	0.9	2.3	2.3	---	3
	Other	3.2	3.7	2.8	1.8	1.4	2.8	2.3	1.4	---

Table 27
Contingency table of the type of presentation in percentage of the total of option per row.

	Image	Label	Expl. text	Author details	Context.	Image zoom	Link related works	Link news	Other
Image	---	91.3	53.6	41.1	10.1	33.8	10.6	2.4	3.4
Label	95.0	---	53.8	43.7	11.1	34.7	11.1	2.5	4.0
Expl. text	97.4	93.9	---	52.6	14.9	42.1	15.8	3.5	5.3
Author details	97.7	100.0	69.0	---	16.1	47.1	18.4	4.6	4.6
Context.	95.5	100.0	77.3	63.6	---	54.5	40.9	9.1	13.6
Image zoom	100.0	98.6	68.6	58.6	17.1	---	22.9	7.1	8.6
Link related works	100.0	100.0	81.9	72.7	40.9	72.7	---	22.7	22.7
Link news	100.0	100.0	80.0	80.0	40.0	100.0	100.0	---	60.0
Other	77.8	88.9	66.7	44.5	33.3	66.7	55.6	33.3	---

Summing up, around nine tenths of the websites present a combination of images and labels. The presence of the rest of the options decreases significantly reaching non-significant values in cases such as contextualization, the links to related works, the links to related news or other options of presentation of the contents. The combination of the different features varies also greatly among them. In fact, the more advanced the option, the smaller the percentage of presence. Consequently, **the presentation of contents of the selected institutional museum sites can be described as quite simple, linear and curator-led due to the massive use of traditional images and labels and in a lower degree of explaining texts, author details and image zooming options**.

4.1.5.- Educational resources

As mentioned during the explanation of the research, one of the objects of analysis of the websites is the presence of educational resources. More than three fourths of the total amount of websites present any kind of educational resources. Most of the websites with any educational resource have a schedule or contact place for the education or pedagogical department of the institution. Taking all the sites and not only the ones with educational resources, this feature is present on three fourths of them. One third of the sites with educational resources have some publications online, representing one fourth of the total amount of analysed sites. Among the websites with these kinds of resources, a little more than a fourth has some downloadable activities to be fulfilled in-situ on the institution's infrastructures. This percentage decreases to twenty per cent when taking into account the whole sample of analysed sites. Virtual activities, on the other hand, represent around a ten per cent in both cases and more complex edutainment activities do not even reach this value in any of the analyses.

Table 28
Number of museums per type of educational resources, percentage of the total and percentage of those with educational resources.

Educational resources	**N**	**%**	**% of those with educational resources**
Schedule and contact	164	74.8	95.9
Publications	55	25.1	32.2
In-situ activities	45	20.5	26.3
Virtual activities	21	9.6	12.3
Edutainment activities	15	6.8	8.8
Other	2	0.9	1.2

Related to the combination of the educational resources, the panorama is varied, because there is not a clearly predominant option. In fact, the combination of the schedule and contact information with any kind of publication is the most popular one, although it represents merely thirty per cent of the total amount of the websites with educational resources. Taking into account the whole sample, moreover, this percentage decreases to lower than a fourth of the global population. On a second place, schedule and contact information present a combination with in-situ downloadable activities of a fourth of the total of websites with educational resources and around a fifth of the global amount. Among the rest of possible combinations, only the ones of publications and in-situ activities and of schedule and contact information and virtual activities are above a tenth of the sample with educational resources, even though the global percentage for the latter does not reach this value. The next highest value, similarly, comes again by the

combination of schedule and contact information with edutainment activities. Regarding the percentage of combination in terms of total amount of each option, the schedule and contact information is present in almost all the combinations with the remaining features. Analysing the other direction, however, none of the educational resources reaches a third in combination with the schedule and contact information. Actually, the combination of publications reaches three tenths and the one of in-situ activities a fourth as highest values for the schedule and contact information. Looking at the websites with edutainment activities, two thirds of them present a combination either with publications or with in-situ activities. When analysing the combination of publications and in-situ activities, it can be identified that in sixty per cent of the websites with the latter are also present publications, but it happens only in half of the cases the other way round. The same phenomenon occurs in relation to in-situ and virtual activities, because, while in sixty per cent of the websites with virtual ones there are also in-situ activities, only a quarter presents this combination in the other direction. Finally, the last most significant combination takes place between virtual and edutainment activities with a presence of around a half among the sites with the latter one and of a third among the first ones.

Table 29
Contingency table of the type of education resources in frequency and percentage of the total of those with educational resources.

		N of total Schedule and contact	Publications	In-situ activities	Virtual activities	Edutainment activities	Other
% of total	**Schedule and contact**	---	50	43	21	15	2
	Publications	29.2 (22.9)	---	28	9	10	0
	In-situ activities	25.1 (19.7)	16.4 (12.8)	---	13	10	0
	Virtual activities	12.3 (9.6)	5.3 (4.1)	7.6 (6.0)	---	7	1
	Edutainment activities	8.8 (6.9)	5.8 (4.6)	5.8 (4.6)	4.1 (3.2)	---	0
	Other	1.2 (0.9)	0.0 (0.0)	0.0 (0.0)	0.6 (0.5)	0.0 (0.0)	---

Note: Values in parentheses refer to the percentage of the total of the sample

Table 30
Contingency table of the type of educational resources in percentage of the total of option per row.

	Schedule and contact	Publications	In-situ activities	Virtual activities	Edutainment activities	Other
Schedule and contact	---	30.5	26.2	12.8	9.1	1.2
Publications	90.9	---	50.9	16.4	18.2	0.0
In-situ activities	95.6	62.2	---	28.9	22.2	0.0
Virtual activities	100.0	42.9	61.9	---	33.3	4.8
Edutainment activities	100.0	66.7	66.7	46.7	---	0.0
Other	100.0	0.0	0.0	50.0	0.0	---

Summing up, the presence of educational resources among museums' institutional sites takes place in three fourths of the whole cases, mainly through schedule and contact information of the department or section of the institution itself. As the complexity of the resources grows, the percentage of presence decreases considerably. This is also the reason for the not really high percentage of combination of educational resources.

4.1.6.- Combinations of the different features of the websites

Once the general patterns of use of the different features have been analysed, it is necessary to identify the patterns of their combination in order to delimit potential archetypical models of implementation of web applications. All the combinations of features have been analysed using a twofold analysis. On the one hand, multiple crosstabulations have been used in order to remark simple relations between only two features. On the other, to highlight multiple relations between various features, the research has carried out another more complex analysis of association rules among them. This second analysis identifies different rules of combination of the features on the process of delimiting models of technological implementation.

Every part of this analysis has been structured into three subsections, which present different perspectives on the same relation. First of all, the combination of the different elements has been analysed from a global point of view. In other words, the combination of web features has been measured taking into account the whole sample[46]. The other section of each part, on the contrary, takes into account only those websites who implemented the categories of the research analysed. Consequently, apart from the initial global presence of the combination, it has also been analysed from the perspective of each

[46] Except for the case of educational resources, where 48 cases are disregarded due to the absence of these resources on their websites, and another case when dealing with the presentation of the content, because it presents no feature of this category.

element of the combination. For a better comprehension of the results, they have been grouped and presented according to the following scheme: *searching options, presentation of the collection, presentation of the contents and educational resources*.

The first relation to be analysed has been the one between the *searching options* of the websites and the *presentation of the collection* of the institution. As have been seen, the existing searching options have been labelled as simple, advanced, complex and combined, apart from the obvious option of their total absence. Similarly, related to the features of the presentation of the collection, due to the absence of immersive environments, they have been removed for any further analysis. Attending to all the possible combinations of the features of the two categories, the one of the highlights of the collection and the absence of any searching option is the most present one among all the websites of the sample, because nearly a third of them have it. The following most present relations are made with the combined searching option. In fact, more than a quarter of the websites present a direct relation of combined searching tools with either databases or collections. Equally, more than one out of five websites also implement these combined searching tools together with browsable catalogues of the holdings of the institution and more than 17.0 per cent with highlights of the collection. Similarly, more than one tenth of the websites do not implement any searching tool, but present a great part of the collection or a browsable catalogue of the contents. Finally, among the representative relations of features, less than one tenth of the websites implement simple searching tools combined either with highlights or a great part of the collection.

Table 31
Contingency table of features to present the digital collection and searching tools in percentage of the total.

	None	**Simple**	**Advanced**	**Complex**	**Combined**
Catalogue	12.8	5.9	3.7	2.3	22.8
Database	0.9	5.5	4.1	3.7	26.9
Highlights	31.5	9.1	3.7	1.4	17.4
Collection	13.7	9.6	4.1	3.7	28.3
Exhibitions	4.6	2.7	1.8	1.4	5.5
Virtual museum	3.2	0.0	1.4	0.9	2.7
Reconstructions	0.0	0.5	0.0	0.0	0.0
Other	1.8	0.0	0.0	0.0	0.0

It is also necessary to analyse all these relations from the perspective of each element. Beginning from the different types of presenting the collection, the combination of various tools is the most pre-eminent option for two thirds of the websites with databases, as well

as for around a half of those with catalogues or a great part of the collection. Similarly, half of the websites with highlights have not implemented any searching tool. Moreover, two fifths of websites that have implemented virtual museum applications do not have any searching option. Taken each element as a whole, there is an evident disequilibrium of the degrees of searching among the websites with catalogues, databases, great part of the collection or highlights, being the combination of searching tools the most prominent option for the first three and no searching option for the last one. Regarding websites with digital exhibitions or virtual museums, however, the options are more equilibrated, but with a greater presence of an absence of searching tools and a combination of them in both cases.

Taking into account the degree of searching of the websites, on the other hand, databases and a great part of the collection are present in about nine out of ten websites with complex searching tools. Attending to the websites with combined searching tools, around ninety per cent of the sample present the collection or a database and in three fourths a browsable catalogue. Highlights, similarly, are present in more than half of the websites with combined searching tools. Among the websites with advanced searching tools, eight out of ten present either a database or a digital collection and seven out of ten either a browsable catalogue or some highlights of the collection. The same percentage of seven tenths among websites with no searching options present some highlights of the collection and three out of ten present some browsable catalogue. Finally, more than half of the websites with simple searching tools have either highlights or a great part of the collection and a third either catalogues or databases.

Table 32
Contingency table of features to present the digital collection and searching tool of the total of option per row

	None	Simple	Advanced	Complex	Combined
Catalogue	26.9	12.5	7.7	4.8	48.1
Database	2.2	13.3	10.0	8.9	65.6
Highlights	50.0	14.5	5.8	2.2	27.5
Collection	23.1	16.2	6.9	6.2	47.7
Exhibitions	28.6	17.1	11.4	8.6	34.3
Virtual museum	38.9	0.0	16.7	11.1	33.3
Reconstructions	0.0	100.0	0.0	0.0	0.0
Other	100.0	0.0	0.0	0.0	0.0

Table 33
Contingency table of features to present the digital collection and searching tool of the total of option per row

	Catalogue	Database	Highlights	Collection	Exhibition	Virtual museum	Recons.	Other
None	29.2	2.1	71.9	31.3	10.4	7.3	0.0	4.2
Simple	36.1	33.3	55.6	58.3	16.7	0.0	2.8	0.0
Advanced	72.7	81.8	72.7	81.8	36.4	27.3	0.0	0.0
Complex	55.6	88.9	33.3	88.9	33.3	22.2	0.0	0.0
Combined	74.6	88.1	56.7	92.5	17.9	9.0	0.0	0.0

The second main area of relation of categories is the one of the *searching tools options* and the *presentation of the contents*[47]. Globally taken, the highest values are reached by the relations of the absence or the combination of different searching tools. In fact, two fifths present images on the presentation of the content with no searching tool and slightly more than a third a label of the content and the absence of any searching option. The following two relations in percentage of total presence are the ones of the previous features of presentation with a combination of searching tools and in both cases less than one third of the websites of the sample have it. One fifth of the total sample present explaining texts of the content with no searching tool. If the same presentation feature is analysed in relation to the combination of searching tools, however, the presence percentage decreases to around 15.0 per cent of the sample. Six out of ten websites, moreover, relate a combination of searching options to the delivery of some author details of the content or the presence of a zooming option in the image. Similar percentage combines the presentation of the content by images or a label with a simple searching tool. Finally, the last representative relation is the one of the author details with no searching option on the website, which can be found in one tenth of the sample.

Table 34
Contingency table of features to present the content and searching tools in percentage of the total.

	Image	Label	Expl. text	Author details	Context.	Image zoom	Link related works	Link news	Other
None	42.2	35.8	22.9	10.6	3.7	6.9	1.8	0.5	1.1
Simple	16.5	16.1	7.3	7.3	0.9	5.0	0.9	0.0	0.0
Advanced	4.6	5.0	3.7	2.8	0.0	2.3	0.5	0.0	0.5
Complex	3.2	4.1	3.2	2.8	1.4	1.4	0.9	0.0	0.0
Combined	28.4	30.3	15.1	16.5	4.1	16.5	6.0	1.8	2.3

Analysing the relations from the perspective of the different searching degrees, in all the cases the values of the image and label in combination with the different searching options are present in at least three fourths of the websites with each searching degree. In both

[47] The sample in this case is 218, due to the absence of presentation of contents of one of the entries.

explaining texts and author details, the websites with advanced and complex searching tools are the ones with the highest values. In fact, the advanced, complex and combined tools are the most presents in all the most complex features of presentation of the content.

When analysing the combination from the other perspective, in all the features the highest values are the absence of any searching tool and the combination of some of them. Websites with images, label and explaining texts predominantly implement no searching tool, while those ones with author details, contextualization, image zooming options, links to related works and links to news combine different searching tools on their digital versions. Except from the websites with label and contextualization information, the difference between the absence of any searching tools and the combination of some of them is higher than ten percentage points.

Table 35
Contingency table of features to present the content and searching tools in percentage of the total of option per row.

	Image	**Label**	**Expl. text**	**Author details**	**Context.**	**Image zoom**	**Link related works**	**Link news**	**Other**
None	96.8	82.1	52.6	24.2	8.4	15.8	4.2	1.1	3.2
Simple	100.0	97.2	44.4	44.4	5.6	30.6	5.6	0.0	0.0
Advanced	90.9	100.0	72.7	54.5	0.0	45.5	9.1	0.0	9.1
Complex	77.8	100.0	77.8	66.7	33.3	33.3	22.2	0.0	0.0
Combined	92.5	98.5	49.3	53.7	13.4	53.7	19.4	6.0	7.5

Table 36
Contingency table of features to present the content and searching tools in percentage of the total of option per row.

	None	**Simple**	**Advanced**	**Complex**	**Combined**
Image	44.4	17.4	4.8	3.4	30.0
Label	39.2	17.6	5.5	4.5	33.2
Explaining text	43.9	14.0	7.0	6.1	28.9
Author details	26.4	18.4	6.9	6.9	41.4
Contextualization	36.4	9.1	0.0	13.6	40.9
Image zoom	21.4	15.7	7.1	4.3	51.4
Link related works	18.2	9.1	4.5	9.1	59.1
Link news	20.0	0.0	0.0	0.0	80.0
Other	33.3	0.0	11.1	0.0	55.6

When looking at the combination of *searching options* and *educational resources* the sample shrinks, because 48 entries have to be disregarded due to their absence of educational resources. Anyway, as a whole, any kind of educational resource is present in three tenths of the total sample in combination with no searching tools and in one out of four websites in relation to combined searching tools. About 15.0 per cent present a combination of simple searching tools with any kind of educational resources.

Taking into account only the cases with educational resources and each resource separately, the schedule and contact information of the educational resources is present together with a combination of searching tools or a total absence of them in a third of the sample. This schedule and contact information is, similarly, combined in a fifth of the sample with a simple searching tool. Among the rest of the relations, the absence and the combination of searching tools is related to publication and to in-situ downloadable activities in about a tenth of the sample.

Table 37
Contingency table of educational resources and searching tools in percentage of the total.

	None	Simple	Advanced	Complex	Combined
Schedule, contact	35.1	19.9	4.7	4.1	32.2
Publications	9.4	5.8	3.5	2.9	10.5
In-situ activities	8.2	3.5	3.5	0.6	10.5
Virtual activities	3.5	2.3	0.0	1.2	5.3
Edutainment activities	2.3	0.6	0.6	0.6	4.7
Other	0.0	0.6	0.0	0.0	0.6

Taking the perspective of the different types of educational resources, the absence and the combination of different searching tools are the most present options in all the cases. Except for the schedule and contact information, in the rest of the features the combination of searching tools is the most present option. In fact, all the values for the combined search range from a third to more than a half, whilst for the absence of any searching tool the values decrease and range from more than a fourth to more than a third of the sample. It is also important to remark that about a fifth of the websites with schedule and contact information, publications and virtual activities have implemented a simple searching tool.

If the analysis is done from the perspective of the searching option, however, it can be identified that the smallest value of the schedule and contact information is in combination with the advanced searching option, but it is only slightly lower than nine tenths. Besides, this kind of information is present in all the websites with simple, complex or combined searching tools. Publications are the second most present feature in all cases, but its presence ranges from one fourth in the case of websites with no searching tools to more than two thirds in the case of the sites with advanced and complex searching options. Also two thirds of the sites with advanced searching tools have in-situ activities to be

downloaded and a third of the ones with combined searching tools. The in-situ activities are also present in one out of five websites with no searching tool. Finally, less than three tenths of the websites with complex searching tools have also implemented some kind of virtual museum application.

Table 38
Contingency table of educational resources and searching tools in percentage of the total of option per row

	None	Simple	Advanced	Complex	Combined
Schedule, contact	36.6	20.7	4.9	4.3	33.5
Publications	29.1	18.2	10.9	9.1	32.7
In-situ activities	31.1	13.3	13.3	2.2	40.0
Virtual activities	28.6	19.0	0.0	9.5	42.9
Edutainment activities	26.7	6.7	6.7	6.7	53.3
Other	0.0	50.0	0.0	0.0	50.0

Table 39
Contingency table of educational resources and searching tools in percentage of the total of option per row

	Schedule, contact	Publications	In-situ activities	Virtual activities	Edutainment activities	Other
None	90.9	24.2	21.2	9.1	6.1	0.0
Simple	100.0	29.4	17.6	11.8	2.9	2.9
Advanced	88.9	66.7	66.7	0.0	11.1	0.0
Complex	100.0	71.4	14.3	28.6	14.3	0.0
Combined	100.0	32.7	32.7	16.4	14.5	1.8

Another important area of combination is the one of the features for the *presentation of the collection* and the features for the *presentation of the content itself*[48]. Globally speaking, three fifths of the sample have some highlights presented by an image and more than half presented by a label with data of the content. Similarly, also more than half of the websites present a combination of a great part of the collection either with an image or with a label. Catalogues are combined with images or labels also in some more of two fifths of the sample, but this percentage decreases to two fifths when combining these presentation features with databases. The combination of explaining texts with highlights and a great part of the collection can be identified in two fifths and three tenths, respectively. Once again, if the feature is combined with catalogues and databases, these percentages decrease to around a fourth of the sample for this analysis. This same percentage is reached by the combination of author details with the above mentioned four types of presentation of the collection. Finally, it is also remarkable that one out of four websites of the sample

[48] Due to the absence of presentation of contents in one of the cases, the sample for this analysis consists of 218 entries.

combine the presentation of a great part of the collection with an option of zooming the digital image.

Table 40
Contingency table of presentation of the collection and presentation of the contents in percentage of the total.

	Image	Label	Expl. text	Author details	Context.	Image zoom	Link related works	Link news	Other
Catalogue	44.5	45.9	28.4	23.9	5.5	20.2	8.3	1.8	3.2
Database	38.1	40.4	22.0	23.9	5.5	20.6	7.8	1.8	2.8
Highlights	61.5	56.9	39.0	24.8	6.0	18.8	6.9	1.8	3.2
Collection	56.4	57.8	30.3	28.4	7.8	25.7	8.7	2.3	2.3
Exhibitions	15.6	15.1	10.1	7.8	3.2	7.3	4.1	2.3	1.4
Virtual museum	7.3	8.3	5.5	4.6	2.3	4.1	1.4	0.9	1.8
Recons	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

When taking a closer look at the combination from the perspective of the type of presentation of the contents, it can be identified that in all cases the images and label of the content are present at least in about nine tenths of the sample. In fact, only the combination of highlights and label and the one of virtual museums and images are slightly below this percentage. Among the pages with reconstructions, images and labels are present in every one, while labels are also present in each website with virtual museum applications. Websites with reconstructions, however, do not have any other feature than images and label. Explaining texts range their presence from half of the websites with a great part of the collection to two thirds of the ones with virtual museums. Author details, similarly, are present in between 47.7 per cent in websites with collections and nearly 58.0 per cent in sites with databases, excepting the case of the ones with highlights where this kind of information is not even present in two fifths. The same pattern can be highlighted with the image zoom options, because all values of presence range from two fifths to half of the cases, but in the case of the websites with highlights the presence decreases to three tenths. Among the rest of combinations, the most important ones are the presence of contextualization information in a fourth of the sites with virtual museums and in a fifth of the ones with digital exhibitions.

From the perspective of the presentation of the context[49], the highlights and the presentation of a great part of the collection have the greatest values in all the cases, except sites with image zoom options, links to related works and links to news, with values

[49] Due to the small amount of websites with links to news of the content, they will not be analysed in this section.

between three fifths and three fourths. The following two most important features are in all cases the catalogues and the databases, being the lowest presence the one of the databases in websites with images in a percentage of two fifths and the highest the one of both features in three fifths of the websites with author details. This pattern is completely reshaped in sites with image zoom and links to related works, where highlights become the fourth feature in terms of presence. Digital exhibitions are the fifth feature in all cases with an important presence of four tenths in the websites with links to related works. Among the rest of combinations, the most significant presence is the one of the virtual museums in one fifth of the websites with contextualization information.

Table 41
Contingency table of presentation of the collection and presentation of the contents in percentage of the total of option per row.

	Image	**Label**	**Expl. text**	**Author details**	**Context.**	**Image zoom**	**Link related works**	**Link news**	**Other**
Catalogue	93.3	96.2	59.6	50.0	11.5	42.3	17.3	3.8	6.7
Database	92.2	97.8	53.3	57.8	13.3	50.0	18.9	4.4	6.7
Highlights	97.1	89.9	61.6	39.1	9.4	29.7	10.9	2.9	5.1
Collection	94.6	96.9	50.8	47.7	13.1	43.1	14.6	3.8	3.8
Exhibitions	97.1	94.3	62.9	48.6	20.0	45.7	25.7	14.3	8.6
Virtual museum	88.9	100.0	66.7	55.6	27.8	50.0	16.7	11.1	22.2
Reconstr.	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 42
Contingency table of presentation of the collection and presentation of the contents in percentage of the total of option per row.

	Catalogue	**Database**	**Highlights**	**Collection**	**Exhibitions**	**Virtual museum**	**Reconstr.**	**Other**
Image	46.9	40.1	64.7	59.4	16.4	7.7	0.5	1.4
Label	50.3	44.2	62.3	63.3	16.6	9.0	0.5	0.0
Expl. text	54.4	42.1	74.6	57.9	19.3	10.5	0.0	0.0
Author details	59.8	59.8	62.1	71.3	19.5	11.5	0.0	0.0
Context.	54.5	54.5	59.1	77.3	31.8	22.7	0.0	0.0
Image zoom	62.9	64.3	58.6	80.0	22.9	12.9	0.0	0.0
Link related works	81.8	77.3	68.2	86.4	40.9	13.6	0.0	0.0
Link news	80.0	80.0	80.0	100.0	100.0	40.0	0.0	0.0
Other	77.8	66.7	77.8	55.6	33.3	44.4	0.0	0.0

The fifth area of analysis is the combination of type of *presentation of the digital collection* and the *educational resources* of the websites. Analysing all the websites, half of them present a combination of highlights and any kind of educational resource. Similar percentage is

reached when dealing with a great part of the collection. Two fifths, similarly, present a combination of catalogues and educational resources and a third another one with databases and these resources. The final representative combination is the one of digital exhibitions with any educational resources, which represents less than a seventh of the total sample.

Regarding only those with educational resources, the most present combinations in the sample[50] are the ones of some highlights and a great part of the collections with schedule and contact information, with more than three fifths of the websites. Catalogues and databases interact also with schedule and contact information in more than four tenths of the sample, as well as digital exhibitions do it in about one fifth. Publications and in-situ activities appear in combination with all the features in similar percentages, even though the presence of the latter ones is slightly lower. In both cases, highlights and a great part of the collection are the most pre-eminent ones, followed by catalogues and databases. In all cases, values range from about fifteen per cent to a fifth of the sample for this analysis. In these cases, the difference between the percentages for publications and the ones for in-situ activities is of around one point, except for the case of collections, where it increases to four percentage points. Among the rest of the combinations, only the ones of highlight and virtual activities and the one of digital exhibitions and downloadable in-situ activities reach a presence of one out of ten.

Table 43
Contingency table of presentation of the collection and educational resources in percentage of the total.

	Schedule, contact	**Publications**	**In-situ activities**	**Virtual activities**	**Edutainment activities**	**Other**
Catalogue	48.5	17.0	15.2	7.6	5.3	0.6
Database	43.9	16.4	15.2	7.6	6.4	0.6
Highlights	62.6	19.3	18.7	10.5	7.0	1.2
Collection	60.2	22.8	18.7	8.2	6.4	0.6
Exhibitions	18.1	12.9	9.9	4.1	1.8	0.0
Virtual museum	9.4	4.7	4.1	2.9	0.6	0.0
Reconstr.	0.6	0.6	0.6	0.0	0.0	0.0
Other	0.0	0.6	0.0	0.0	0.0	0.0

If analysed from the point of view of the presentation of the collection, the general pattern remains the same as the recently explained general one, but with higher values. Schedule and contact information are present in nearly all the websites with different features.

[50] The sample of this analysis is 171, because there are 48 websites with no educational resources.

Publications and in-situ activities are delivered in websites with catalogues, databases, highlights and collections in three tenths of the sample at least. In the websites with exhibitions and virtual museums, anyhow, values increase and represent at least half of the sample, except for in-situ downloadable activities, which are present in more than four tenths of the websites with virtual museums. This phenomenon is also identifiable when looking at the presence of virtual activities, because the highest values are the ones of the websites with virtual museums and digital exhibitions, with three tenths and one fifth respectively. The catalogues, databases, highlights and collection, on the contrary, reach at most about fifteen per cent of the sample. Taking a look at the sites with reconstructions, finally, they all present schedule and information contact, publications and in-situ activities, but no other feature.

Analysing the combinations from the perspective of the educational resources, conversely, highest values are always identified with highlights and presentation of a great part of the collection. Among them, the lowest and the highest values are combinations of highlights in three fifths of the pages with publications and around 85.0 per cent in the ones with virtual activities respectively. In all cases, except for sites with publications, the highest value corresponds to the presence of highlights on the websites. The difference between highlights and collections is not big, apart from the sites with publications, edutainment and virtual activities, with differences bigger than a seven per cent, reaching even nineteen percentage points in the case of the latter ones. Catalogues and databases follow a similar pattern in the sites with all the different educational resources with values ranging from the half to three fourths, except for databases in websites with schedule and contact information that are present in more than 45.0 per cent of the entries. These two presentation features have exactly the same percentage of presence in websites with in-situ and virtual activities. In the rest of the websites, catalogues have a greater presence than databases. This fact cannot be applied to sites with edutainment activities, where the pattern becomes the contrary and even reaches thirteen percentage points of difference. Digital exhibitions are the fifth most present feature in all the cases. They get a presence of two fifths among the websites with publications, of a third in the ones with in-situ and virtual activities and a fifth in the ones with edutainment activities. Finally, virtual museums have a presence of a fourth in sites with virtual activities.

Table 44
Contingency table of presentation of the collection and educational resources in percentage of the total per row.

	Schedule, contact	Publications	In-situ activities	Virtual activities	Edutainment activities	Other
Catalogue	98.8	34.5	31.0	15.5	10.7	1.2
Database	100.0	37.3	34.7	17.3	14.7	1.3
Highlights	96.4	29.7	28.8	16.2	10.8	1.8
Collection	97.2	36.8	30.2	13.2	10.4	0.9
Exhibitions	96.9	68.8	53.1	21.9	9.4	0.0
Virtual museum	100.0	50.0	43.8	31.3	6.3	0.0
Reconstr.	100.0	100.0	100.0	0.0	0.0	0.0
Other	0.0	100.0	0.0	0.0	0.0	0.0

Table 45
Contingency table of presentation of the collection and educational resources in percentage of the total per row.

	Catalogue	Database	Highlights	Collection	Exhibitions	Virtual museum	Reconstr.	Other
Schedule, contact	50.6	45.7	65.2	62.8	18.9	9.8	0.6	0.0
Publ.	52.7	50.9	60.0	70.9	40.0	14.5	1.8	1.8
In-situ activities	57.8	57.8	71.1	71.1	37.8	15.6	2.2	0.0
Virtual activities	61.9	61.9	85.7	66.7	33.3	23.8	0.0	0.0
Edutain. activities	60.0	73.3	80.0	73.3	20.0	6.7	0.0	0.0
Other	50.0	50.0	100.0	50.0	0.0	0.0	0.0	0.0

The last area of analysis of the relation between different features is the one of the *presentation of the contents* and the *educational resources*. Three fourths of the total sample combine images and labels with educational resources. Four tenths have both explaining texts and educational resources and a third combine these resources with author details. A fourth, similarly, have some kind of image zoom and resources to reinforce the learning processes. Finally, the combination of contextualization information on the one hand and of links to related works on the other with educational resources is present in less than a tenth of the whole sample.

Within the sample of the sites with educational resources[51], nine out of ten websites present a combination of schedule and contact information with images or labels for the presentation of the content. Moreover, schedule and contact information is also combined with explaining texts of the content in half of the cases, with author details in about 45.0 per cent of the sample and with image zooming options in a third of the websites.

[51] The sample for this analysis is 170, since 48 entries do not have any educational resource and another one any feature for the presentation of the contents.

Combinations with publications are the second most important ones, because they present higher values than the others, except for the explaining texts, author details and links to related works, where in-situ activities have greater presence. In the first two cases, the difference is of one percentage point and in the third one of more than half point. Anyway, the combination of publications with either images or labels can be identified in three tenths of the sample, whilst the one with in-situ activities hardly exceed a fourth. Publications and in-situ activities are combined with explaining texts in about a fifth, with author details in about fifteen per cent and with image zooming options in more than a tenth of the sample. Also the combination of virtual museums with images and label is present in more than a tenth of the websites.

Table 46
Contingency table of presentation of the contents and educational resources in percentage of the total.

	Image	**Label**	**Expl. text**	**Author details**	**Context.**	**Image zoom**	**Link related works**	**Link news**	**Other**
Schedule, contact	92.9	90.6	50.6	44.1	10.6	32.9	9.4	2.4	4.7
Publ.	31.2	29.4	19.4	14.1	5.3	12.4	4.1	2.4	2.9
In-situ activities	25.9	25.9	20.6	15.3	4.1	11.8	4.7	1.8	2.9
Virtual activities	11.8	11.8	7.6	9.4	2.9	5.3	4.1	1.2	1.8
Edutain. activities	8.8	8.2	6.5	4.1	0.6	4.1	1.8	0.6	0.6
Other	1.2	1.2	0.6	1.2	0.6	1.2	0.6	0.0	0.0

When analysing the relation of the features from the perspective of the educational resources, it can be highlighted that in all the cases the combination with images and labels is present in more than nine tenths of the sample. Explaining texts have the third place and author details the fourth one, except for the case of websites with virtual activities where the pattern becomes exactly the contrary with an advantage of fifteen percentage points. Apart from the combinations in websites with schedule and contact information that reach more than half and than 45.0 per cent respectively, the difference of explaining texts with author details is around twenty percentage points. In fact, values for explaining texts never go below three fifths of the sample, while for author details the higher value, not taking into account sites with virtual activities, do not even reach this percentage. It is also remarkable that image zoom options are always the fifth most implemented features, with values ranging from a third to 45.0 per cent of the sample.

Taking the perspective of the features for the presentation of the content, on the other hand, there are large differences between the presence of schedule and contact information of the educational resources and the rest of the features. These differences are based on the massive implementation of this information by the websites of the sample and the lower degree of implementation of the rest of the features. In fact, schedule and contact information is present at least in nine out of ten websites with each presentation of content feature. Publications occupy the second place in degree of implementation in each category, except for explaining texts, author details and links to related works, where its place is taken by the in-situ activities. Anyway, the difference between these two educational resources is at most of five percentage points, apart from the case of the websites with some contextualization information, where publications reach a presence of half of the sample and in-situ activities rank eleven percentage points below. The lowest presence of publications is in websites with author details with three tenths and the highest one in the ones with links to news, where the presence is total. For in-situ activities, the lowest value is of a fourth in websites with images and the highest, once again, in the ones with links to news, with a presence in three out of four of them. Apart from the presence in half of the websites with links to news, there is an important implementation of virtual activities in two fifths of the websites with links to related works. In the rest of the cases, the values for virtual activities range from above a tenth to around a fourth of the sample. Finally, edutainment activities are present in around a tenth of the websites, except for the cases of the ones with links to news and links to related works with a presence of a fourth and more than 15.0 per cent respectively and for the case of websites with contextualization information, in which the presence takes place in only slightly more than five per cent of the sample.

Table 47
Contingency table of presentation of the content and educational resources in percentage of the total of option per row.

	Image	**Label**	**Expl. text**	**Author details**	**Context.**	**Image zoom**	**Link related works**	**Link news**	**Other**
Schedule, contact	96.3	93.9	52.4	45.7	11.0	34.1	9.8	2.4	4.9
Publ.	98.1	92.6	61.1	44.4	16.7	38.9	13.0	7.4	9.3
In-situ activities	97.8	97.8	77.8	57.8	15.6	44.4	17.8	6.7	11.1
Virtual activities	95.2	95.2	61.9	76.2	23.8	42.8	33.3	9.5	14.3
Edutain. activities	100.0	93.3	73.3	46.7	6.7	46.7	20.0	6.7	6.7
Other	100.0	100.0	50.0	100.0	50.0	100.0	50.0	0.0	0.0

Table 48
Contingency table of presentation of the content and educational resources in percentage of the total of option per row.

	Schedule, contact	Publications	In-situ activities	Virtual activities	Edutainment activities	Other
Image	96.9	32.5	27.0	12.3	9.2	1.2
Label	96.9	31.4	27.7	12.6	8.8	1.3
Expl. text	93.5	35.9	38.0	14.1	12.0	1.1
Author details	96.2	30.8	33.3	20.5	9.0	2.6
Context.	100.0	50.0	38.9	27.8	5.6	5.6
Image zoom	96.6	36.2	34.5	15.5	12.1	3.4
Link related works	94.1	41.2	47.1	41.2	17.6	5.9
Link news	100.0	100.0	75.0	50.0	25.0	0.0
Other	100.0	62.5	62.5	37.5	12.5	0.0

4.1.7.- Association rules of the different features on the websites of museums

Nevertheless, due to the complex character of the websites, these one to one relations are not enough to delimit models of implementation of web technologies by museums. The relation of features in manifold and a plain linear crosstabulation of the different features cannot explain their multiple combinations. In fact, in order to fulfil the task of highlighting archetypical models of web technology implementation, the research has carried out a process of identification of association rules among the different elements of the websites. According to the theoretical framework of the research[52], the rules analysed deal with the searching options, the type of presentation of the collection and the educational resources to answer the premises. All the identified association rules delimit some kind of combination of features that in a great degree is related to the implementation of a concrete element on the website. Therefore, the combination of different features can be identified as an antecedent for the further implementation of another specific consequent one.

To identify and delimit the different association rules, some concrete initial requirements were established. First of all, the combination of features that are considered antecedents should have at least a presence in fifteen out of a hundred of the cases. Or in other words, any antecedent should have a support of 15.0 per cent of the analysed sample[53]. On the other hand, due to the big amount of potential non relevant rules, the minimum confidence of them has been established in a 95.0 per cent. That is, each rule has to be positively applicable in at least this percentage of the support cases to be considered valid. The

[52] See section "3.1.- Theoretical framework" for an explanation of this framework.
[53] In some specific cases, to obtain some results, the support requirement has been lowered to 10.0 or 5.0 per cent due to the significantly lower overall presence of the consequent feature.

combination of the results of these both requirements gives as a result the support percentage of the rule. Evidently, the support percentage of the rules with total confidence will be the same of the support percentage of the antecedent.

Attending to the searching options of the websites, one of the first results of the work is that there is no combination with a presence of a 15.0 per cent of the sample. Consequently, as there will be no rule that matches the support requirement, it has been lowered to only a 5.0 per cent of the whole sample. In fact, even though the support requirement has been lowered, only the combined searching tool is identified as a consequent feature of a specific association rule. The combination of catalogues, databases, highlights, a great part of the collection, image, label, explaining texts, author details, image zoom and links to related works in art museums has in all the cases of the sample as a consequence a combined searching tool. This combination is present in 5.1 per cent of the whole sample and, as the rule is valid in all the cases, the support percentage of the rule is the same one. This general rule, additionally, can be divided into other multiple rules of association with the combined searching tools as a consequence of at least four elements, but each of them has links to related works as an antecedent. The inclusion or exclusion of any of the above mentioned features does not alter either the percentage of support or the confidence degree of the rule.

Regarding the presentation of the holdings of the collection, conversely, the four main features have been analysed separately, namely catalogues, databases, highlights and digital collections. In all the cases, due to their high overall presence, both requirements have been fulfilled, except for the case of highlights, where the support requirement has been lowered to a tenth of the sample.

When dealing with catalogues as a consequent of the combination of many features, the very initial finding is that there is no rule with a total confidence. Anyway, there is a main basic combination of features that has a 97.1 per cent of confidence to have catalogues as well. This combination consists of databases, explaining texts and author details in art museums. This combination has a presence of 15.6 per cent in the whole sample and, applying the degree of confidence of the rule, its support percentage slightly decreases to 15.1 per cent. The inclusion or exclusion of labels and images, being it jointly or separately, does not alter the amount of all these percentages. There is another potential combination

to be applied to obtain an association rule with catalogues as a consequence, which includes the other three main types of presentation of the collection, namely databases, highlights and a great part of the collection. The degree of confidence of this combination to also include catalogues on the website is of 95.2 per cent and, since the global presence of the combination is of 19.3 per cent, the support degree of the rule is of 18.4 per cent. The inclusion of labels in this combination of antecedents does not alter any of these percentages at all, but the one of images, being it together with or separate from labels, drops the confidence of the rule to a 95.0 per cent. Similarly, the support of the antecedent and of the rule decreases to 18.4 and 17.4 per cent respectively.

If databases are analysed as consequent, on the other hand, all obtained rules have a total degree of confidence. The basis for further rules is the association of combined searching tools and author details. As said, the confidence of this combined antecedent is total and its presence of 16.5 per cent. The potential inclusion of labels decreases neither the confidence nor the presence of the association. Nevertheless, the inclusion of images, jointly with labels or alone, drops the presence in about half percentage point, reaching a 16.1 per cent. The confidence of the rule, however, remains total. There is another variant of the rule that fulfils the requirements. The separate inclusion of a great part of the collection or art museums makes the presence decrease until 15.1 per cent. Also in this case, the confidence of the rule is total in this sample.

Analysing the rules with highlights as a consequence, there is no rule with 100.0 per cent of confidence. Moreover, no rule matches the minimum requirement of presence and, consequently, it has been lowered to a minimum of 10.0 per cent. There are three main rules of association. The first main rule is the one of art museums with combined searching tools, catalogues and explaining texts. Images and labels can be included either separately or together with no influence on the percentages. The percentage of confidence of this association is of 95.8 per cent and its support of 11.0 per cent of the global sample. The combination of both percentages gives as a result that the support of the rule is of 10.6 per cent. The second rule is a variation of the first one, but, instead of taking into account the type of institution, it includes image zoom options in the combination of antecedents. The percentages of this rule drop to 95.5 per cent of confidence, 10.1 of support and 9.6 of support of the rule. This rule also follows the same pattern of inclusion of images and labels. Finally, the last rule with highlights as a consequent takes into account again the type

of institution, but not the image zooming option. In this rule, databases and collections separately also repeat the percentages of the previous case, with 95.5 per cent of confidence, 10.1 per cent of support and 9.6 of support of the rule.

Attending to the cases where the consequent feature is the presentation of a great part of the collection, neither in this case there is any rule with 100.0 per cent of confidence. Similarly to the previous set of rules, there are three main rules. The first one presents an association of combined searching tools with catalogues and images. This association rule has a confidence degree of 95.6 per cent and a support of the combination of 20.6 per cent. Applying the confidence to the support of the combination, the presence of the rule drops to 19.7 per cent. On the other hand, the second version is the inclusion of labels and databases separately. Combined with labels, the percentage of confidence decreases to 95.5 per cent and, since the presence of the combination is of 20.2 per cent, the support of the rule to 19.3 per cent. When combined with databases, equally, percentages drop to 95.1, 18.8 and 17.9 per cent respectively. The third main rule, conversely, combines all the above mentioned features together, but percentages decrease to a 95.0 per cent of confidence, 18.4 of presence of the association and 17.4 of support of the whole rule.

Finally, the last area of association of features has educational resources as a consequence. Due to the small amount of the features and the combinations, educational resources have been taken as a global entity, with no difference among the diverse features. Among all the rules of this area of association, there has been no identification of any rule with a 100.0 per cent of confidence. The maximum percentage of confidence reached on this analysis is 96.1 per cent when the association rule combines author details and labels in American museums. The global support of this combination appears in 23.4 per cent of the cases and, consequently, the support of the rule reaches 22.5 per cent of the sample. If these features are combined also with art museums and images separately, the percentage of confidence decreases to 96.0 per cent and the support of the rule to a 22.0, due to the overall presence of the combination of antecedents of a 22.9 per cent. If the rule combines these last two elements together, the confidence percentage drops to 95.9 per cent and the support of combination and of the rule to 22.5 per cent and 21.6 per cent respectively. Finally, even though the confidence threshold is lower than required, a simple searching degree explains the presence of educational resources also on the same website in 94.4 per

cent, which gives to the rule a support of the 15.6 per cent, because of the 16.5 per cent of presence of the antecedent in the global sample.

Table 49
Summary of the main rules of association of features.

Consequent	Antecedent	% of support	% of confidence	% of support of the rule
Databases	Searching tool – combined Labels Author details	16.5	100.0	16.5
Databases	Searching tool – combined Images Labels Author details	16.1	100.0	16.1
Databases	Art museums Searching tool – combined Labels Author details	15.1	100.0	15.1
Databases	Searching tool – combined Collections Labels Author details	15.1	100.0	15.1
Searching tool – Combined**	Art museums Databases Catalogues Collections Highlights Images Labels Explaining text Author details Image zoom Link to related works	5.1	100.0	5.1
Catalogues	Art museums Databases Images Labels Explaining text Author details	15.6	97.1	15.1
Educational resources	USA Labels Author details	23.4	96.1	22.5
Educational resources	USA Art museums Labels Author details	22.9	96.0	22.0
Educational resources	USA Images Labels Author details	22.9	96.0	22.0
Educational resources	USA Art museums Images Labels	22.5	95.9	21.6

	Author details			
Highlights*	Art museums	11.0	95.8	10.6
	Searching tool – combined			
	Catalogues			
	Images			
	Labels			
	Explaining text			
Collections	Searching tool – combined	20.6	95.6	19.7
	Catalogues			
	Images			
Highlights*	Searching tool – combined	10.1	95.5	9.6
	Catalogues			
	Images			
	Labels			
	Explaining text			
	Image zoom			
Highlights*	Art museums	10.1	95.5	9.6
	Searching tool – combined			
	Catalogues			
	Databases			
	Explaining text			
Highlights*	Art museums	10.1	95.5	9.6
	Searching tool – combined			
	Catalogues			
	Collections			
	Explaining text			
Collections	Searching tool – combined	20.2	95.5	19.3
	Catalogues			
	Images			
	Labels			
Catalogues	Databases	19.3	95.2	18.4
	Highlights			
	Collections			
	Labels			
Collections	Searching tool – combined	18.8	95.1	17.9
	Catalogues			
	Databases			
	Images			
Catalogues	Databases	18.4	95.0	17.4
	Highlights			
	Collections			
	Images			
	Labels			
Collections	Searching tool – combined	18.4	95.0	17.4
	Catalogues			
	Databases			
	Images			
	Labels			

Note: * Support requirement lowered to 10.0%
** Support requirement lowered to 5.0%

Summing up, the different features on the websites combine diversely, creating different implementations of the web technologies. In general terms, the unilinear relations between the features have a greater presence when they take place among the most common ones

of the different areas. Logically, the lower the presence of a feature, the lower the percentage of combination. Besides, the multiple combinations of the features give as a result some concrete rules of association that determines the degree of consequence of a concrete feature deriving from a specific antecedent combination of other ones. Consequently, there have been identified some rules of association present in the sample of the research.

4.1.8.- Correlation by country of origin

According to the second premise, the research hypothesizes that there are different models of implementation of web technologies on different countries. Due to this assumption, the following sections deals with the previously seen analyses of the websites, but done taking into account the country of origin of each one[54]. Anyhow, in this case explanations will be more centred on the pattern of implementation of each country to highlight similarities and differences among them.

Analysing the distribution of type of institution per country, it is absolutely necessary to bear continuously in mind the fact that, due to the overwhelming amount of museums in the USA, only institutions under the category of art and history museums on the VLM have been selected for the research. Consequently, no American anthropology museum, archaeology ones or cultural sites can be found among the cases of the sample. Exactly the same phenomenon can be identified when taking a look at German museums, with the exception that in this case all available and valid museums from the VLM have been analysed. Leaving these considerations aside, in all the cases art museums represent more than three fifths of the sample of each country. In fact, art museums of the United Kingdom are the ones with the lowest percentage of presence, being six tenths of the sample, and the American ones the highest ones with nine out of ten cases. Similarly, British history museums reach the lowest score not only in percentage terms, but also in absolute values. Being the second biggest sample, there are only two valid history museums on the VLM regarding the United Kingdom. Conversely, the highest percentage value is reached by Germany, since fifteen per cent of the sample are identified with this category of institution. In the Spanish case, nearly one tenth of the sample is composed by history museums. Although it is one of the only two categories analysed, American history museums represent slightly more than six per cent of the national sample. Regarding

[54] Greece is not taken into account for this analysis due to the presence of only two cases within the whole sample.

anthropology museums, valid cases have only been identified within the British sample in slightly more than seven per cent of the institutions. The same percentage is reached by British archaeology museums, while the Spanish ones represent more than six per cent of the sample. Equally, cultural sites have also been identified only among Spanish and British cases, but with only one case in each country. Finally, cases typified as other type of institutions are more than one tenth in all countries, except for the USA.

Table 50
Type of institutions percentage per country.

	Germany %	Greece %	Spain %	United Kingdom %	USA %
Art museums	70.0	50.0	67.7	62.5	91.8
History museums	15.0	0.0	9.7	3.6	6.4
Anthropology museums	0.0	0.0	0.0	7.1	0.0
Archaeology museum	0.0	0.0	6.5	7.1	0.0
Cultural sites	0.0	0.0	3.2	1.8	0.0
Other	15.0	50.0	12.9	17.9	1.8

Following the identification of the category of the institution, the research has analysed the type of digital resources delivered by each case, taking into account the country of origin. In all the cases, websites presenting both digital collections and educational resources to reinforce the learning processes are more abundant than the ones with only digital collections. The percentages, however, vary greatly. Two thirds of the British institutions deliver both types of digital resources, being the smallest percentage of all countries. Spanish institutions do it in seven out of ten cases and German ones in three fourths. Finally, American museums are the ones with the highest percentage of both digital collections and educational resources, since 86.4 per cent of the museum websites have also a specific section for the reinforcement of the virtual knowledge processes. So, even if in all countries there are significantly more sites with educational resources than with merely digital collections, the percentage of the American ones is importantly higher than the British ones. Consequently, there can be distinguished different degrees of delivery of educational resources within museums from different countries of origin.

Table 51
Type of digital resources percentage per country

	Germany %	Greece %	Spain %	United Kingdom %	USA %
Digital collection	25.0	50.0	29.3	33.9	13.6
Educational resources	0.0	0.0	0.0	0.0	0.0
Both	75.0	50.0	71.0	66.1	86.4

Regarding the searching options of the website of each origin, there are quite significant differences among countries. More than half of the cases of both Spain and Germany do not have any searching tool on their websites for the cultural contents. In fact, the absence of any searching tool can be identified in six out ten Spanish websites of the sample and seven out of ten of the German ones. This percentage drops importantly to slightly more than four tenths among American sites. It is significant also that only a quarter of the British websites do not present any searching tool for the digital contents. When simple searching tools are analysed, American institutions score the highest values, because they are present in a fourth of the sample of the country. In the rest of the countries, values lay around a tenth of the sample, with the lowest value being the one of the United Kingdom. Taking these two options of searching tools together, German, Spanish and American institutions in this category represent eight, seven and six tenths respectively. Nevertheless, only a third of the British institutions are present in this category. The advanced searching tool is present in more than a tenth of the Spanish museums. American institutions of the sample, on the other hand, present a really small percentage of implementation of any advanced searching tool. When dealing with the complex degree of searching tools, only British museums have a representative percentage of implementation in one out of ten cases. American and Spanish museums with complex searching tools do not score significant values. When dealing with the combination of searching tools, the lowest value is identified among the Spanish museums. One out of five German museums combines some searching tools, as well as more than a fourth of the American ones. The British case is the most extreme one, since nearly half of the museums present a combination of diverse searching tools. If advanced, complex and combined searching tools are considered as a whole, the pattern of the simplest options or the absence of them is reversed. Actually, two thirds of the British institutions implement any of these options, while only a third of the American ones, three tenths of the Spanish ones and a fifth of the German ones do it. Consequently, British institutions of this sample have more sophisticated and specific searching tools in a significantly higher degree than the rest of the countries.

Table 52
Type of searching tool percentage per country

	Germany %	Greece %	Spain %	United Kingdom %	USA %
None	70.0	0.0	61.3	26.8	43.6
Simple	10.0	0.0	9.7	7.1	24.5
Advanced	0.0	50.0	12.9	7.1	1.8
Complex	0.0	0.0	3.2	10.7	1.8
Combined	20.0	50.0	12.9	48.2	28.2

The same variety can be identified when the type of presentation of the collection is analysed by country. Catalogues are present in four fifths of the German sample and in nearly three fifths of the British ones. Spanish and American institutions, conversely, implement them not even in half of the sample. In fact, a fifth and a third of the museums from Spain and the USA present catalogues of the contents on their websites. Dealing with databases, British museums are the only ones with a presence over the half, with this feature in two thirds of the sample. Similarly, a third of the American institutions implement databases on their websites, as well as a fourth of the German ones. Finally, only 16.1 per cent of the Spanish museums have some kind of database on their sites. Looking at the presentation of highlights of the collection, more than half of the cases of all countries present them, except for Spain. Actually, highlights are present in more than six tenths of American and British cases and in nine out of ten German ones. Regarding the presentation of a great part of the collection, conversely, museums from Germany score the lowest value, with a presence of only one third. Institutions from the United Kingdom have again the greatest presence of all analysed countries, with nearly seven tenths. American and Spanish institutions present a great part of the collection in nearly three fifths of the sample. The rest of the features do not have a significant presence, except for digital exhibitions in nearly two fifths of the Spanish cases. The same feature is present in more than a tenth of British and American museums. Finally, virtual museums are implemented in a fifth of Spanish cases. Consequently, as happens with the general pattern, in every country the four more general features are the most present ones, but there are considerable differences among them.

Table 53
Type of presentation percentage per country

	Germany %	Greece %	Spain %	United Kingdom %	USA %
Catalogues	80.0	100.0	19.4	58.9	35.5
Databases	25.0	100.0	16.1	67.9	32.7
Highlights	90.0	100.0	45.2	62.5	62.7
Collection	35.0	100.0	58.1	69.6	58.2
Exhibitions	0.0	0.0	38.7	12.5	14.5
Virtual museum	5.0	0.0	19.4	7.1	6.4
Reconstructions	0.0	0.0	0.0	0.0	0.9
Immersive environments	0.0	0.0	0.0	0.0	0.0
Other	0.0	0.0	12.9	0.0	0.0

Looking at the diverse combinations of these options by institutions, there are evident differences among them[55]. **Regarding the overall presence of the combination of catalogues and databases, British institutions present the highest value with more than two fifths, while the rest of the countries have this combination of features in a fourth of the sample**. When catalogues are combined with highlights, the German percentage of presence increases to seven tenths and the British one is two percentage points lower than the half. In the Spanish and American cases, however, it is of about sixteen per cent. Catalogues and collections are combined in a more homogeneous way, because American institutions implement it in three tenths, being the lowest one, and Spanish websites have it in more than 45.0 per cent of the sample as the highest one. The combination of catalogues and digital collections only reaches a significant presence in more than a fifth of the Spanish cases. Since the overall presence of databases is lower in all countries except for the United Kingdom, values of this combination are equally also lower. In fact, while more than one third of the British museums have both databases and highlights, this combination is present in one fifth of the German institutions, more than 17.0 per cent of the American ones and in more than one tenth of the Spanish cases. If analysed the combination with a great part of the collection, values increase significantly, with German websites as the ones with the lowest score due to the presence in a fourth of the sample. British institutions are the ones combining these features most widely, with an overall percentage of about two thirds. American and Spanish websites present this combination in between three tenths and a fourth of the sample. When the combination of databases is analysed with digital exhibitions, only institutions from the United Kingdom and Spain score a relevant percentage of a tenth and slightly more than 16.0 per cent of

[55] Only the five main features are analysed in this section, namely catalogues, databases, highlights, collections and digital exhibitions.

presence respectively. Taking a closer look at the combination of the presentation of highlights and a great part of the collection, once again the highest presence is among British institutions with a third of the sample presenting it. German and American institutions do it in a fourth, while Spanish cases only have this combination in slightly more than 16.0 per cent of the sample. Conversely, Spanish institutions are the ones that implement both highlights and digital exhibitions in a higher degree with a percentage of presence of a fifth. American and British websites present this combination in one out of ten websites, while no German museums have implemented digital exhibitions and highlights. If the combination is analysed with a great part of the collection and not with highlights, nearly three tenths of the Spanish sample have it, while American percentage remains similar. The percentage of British institutions, however, drops below a tenth of the sample.

Table 54
Contingency table of the digital collection in percentage of the total by country

		Catalogue	Database	Highlights	Collection	Exhibitions
Germany	**Catalogue**	---	25.0	70.0	35.0	0.0
	Database	25.0	---	20.0	25.0	0.0
	Highlights	70.0	20.0	---	25.0	0.0
	Collection	35.0	25.0	25.0	---	0.0
	Exhibitions	0.0	0.0	0.0	0.0	---
Spain	**Catalogue**	---	25.8	16.0	45.2	22.6
	Database	25.8	---	12.9	25.8	16.1
	Highlights	16.0	12.9	---	16.1	19.4
	Collection	45.2	25.8	16.1	---	29.0
	Exhibitions	22.6	16.1	19.4	29.0	---
UK	**Catalogue**	---	42.9	48.2	44.6	8.9
	Database	42.9	---	35.7	64.3	10.7
	Highlights	48.2	35.7	---	33.9	10.7
	Collection	44.6	64.3	33.9	---	8.9
	Exhibitions	8.9	10.7	10.7	8.9	---
USA	**Catalogue**	---	24.5	16.4	30.0	5.5
	Database	24.5	---	17.3	28.2	5.5
	Highlights	16.4	17.3	---	23.6	10.9
	Collection	30.0	28.2	23.6	---	11.8
	Exhibitions	5.5	5.5	10.9	11.8	---

Analysing the features used to present the content itself, the pattern is very similar to the general one. In all countries, the presence of images to present the content is superior to ninety per cent of the sample. Regarding the use of labels, Spanish institutions only present this feature in three fourths of the cases and British ones in slightly less than nine tenths. Museums from Germany and the USA, conversely, score more than ninety five per cent in the use of labels. Explaining texts, on the other hand, present a different pattern, because,

while British and German institutions deliver them in around two thirds of the sample, American ones do it on two fifths. The pattern is completely the opposite when dealing with author details, since in this case American museums present the highest percentage of use with more than forty five per cent, whilst the other countries score around a third. The last case with significant differences is the one of the image zooming options. In fact, British museums have this option in nearly half of the cases, but German ones in fifteen per cent of their sample. Spanish and American museums, then again, present zooming options in a quarter and three tenths of the analysed cases.

Table 55
Type of presentation of the collection percentage per country

	Germany %	Greece %	Spain %	United Kingdom %	USA %
Image	100.0	50.0	96.7	94.6	94.5
Label	95.0	100.0	76.7	87.5	96.4
Explaining text	65.0	50.0	56.7	64.3	42.7
Author details	30.0	50.0	30.0	35.7	46.4
Context.	15.0	0.0	10.0	14.3	7.3
Image zoom	15.0	0.0	26.7	48.2	29.1
Link related works	0.0	0.0	10.0	10.7	11.8
Link related news	0.0	0.0	6.7	1.8	1.8
Other	0.0	0.0	10.0	3.6	3.6

Analysing the combination of diverse features to present the contents by country, differences can be identified among them[56]. The presentation by both images and labels is done in more than nine tenths of the American and German samples. This percentage, however, decreases to four fifths and three fourths when looking at British and Spanish institutions. When combining images with explaining texts, percentages drop significantly, since the highest one is the German one that does not even reach a presence of two thirds. This combination is present in three fifths of the British sample and 56.0 per cent of the Spanish one. American institutions, conversely, only present this combination in two fifths of the sample. The contrary pattern is identified when dealing with images and author details, because while American percentage is slightly superior, the British, German and Spanish ones decrease importantly until reaching a presence of a third on the first case and of three tenths on the latter ones. The decrease of percentages is more evident looking at the combination of images and contextualization information. In this case, Germany scores the highest value with less fifteen per cent of the sample. British and Spanish percentages lay around a tenth of the sample and American institutions are below this threshold.

[56] Due to the overall low number of the links to related news, this feature will not be analysed in this section.

Conversely, when analysing the combination of images and zooming options, Germany presents the same percentage, but becomes the sample with the lowest value, because Spanish museums have it in one fourth of the sample and American ones in about three tenths. British institutions, finally, present this combination of images and zooming option in about half of the cases. Regarding the combination of labels with explaining texts, the American sample is the only one that does not score a presence of a half, because Spanish, British and German values rank from above a half to three fifths of the sample. If the combination analysed is the one of labels and author details, on the contrary, the pattern reverses, because American institutions present it in more than 46.0 per cent, whilst British, Spanish and German institutions have it in between slightly more than a third and three tenths of the sample. Taking a look at the presentation of both labels and contextualization information, American museums recover the last position with a presence below a tenth of the sample. Exactly a tenth is the percentage of presence of the combination among Spanish institutions, while for British and German ones it around fifteen per cent of the sample. Both labels and zooming options are present in nearly half of the British institutions, while only a third of the American, a fourth of the Spanish and a tenth of the German ones have the two of them together in their websites. Explaining texts and author details are combined in about a fourth of the American and Spanish institution, three tenths of the German ones and around a third of the British ones, but, if the explaining texts are combined with contextualization information, only British websites of the sample score a percentage of presence over a tenth. When combined together with zooming options of the images, explaining texts are present in more than a third of the British institutions of the sample. Percentage values of Spain, USA and German, conversely, rank from a fifth to about fifteen per cent of their samples. On the other hand, if these zooming options are analysed jointly with author details, values in all countries decrease, except for the USA, where it reaches around a fifth of the sample. Anyhow, British institutions score the highest value again, with a presence in more than a quarter, while Spanish and German institutions have this combination in one out of ten websites. Finally, both the combinations of author details as well as of zooming options with contextualization information reach a significant percentage only among British institutions, where one out of ten sites have any of them. Due to the overall low presence of links to related works, the percentage of presence of combinations arisen from this feature lays around a tenth of the sample of the country at most.

Table 56
Contingency table of type of presentation of the collection in percentage of the total by country

		Image	Label	Expl. text	Author details	Context.	Image zoom	Link related works
Germany	**Image**	---	95.0	65.0	30.0	15.0	15.0	0.0
	Label	95.0	---	60.0	30.0	15.0	10.0	0.0
	Expl. text	65.0	60.0	---	30.0	5.0	15.0	0.0
	Author details	30.0	30.0	30.0	---	5.0	10.0	0.0
	Context.	15.0	15.0	5.0	5.0	---	5.0	0.0
	Image zoom	15.0	10.0	15.0	10.0	5.0	---	0.0
	Link related works	0.0	0.0	0.0	0.0	0.0	0.0	---
Spain	**Image**	---	76.7	56.7	30.0	10.0	26.7	10.0
	Label	76.7	---	53.3	30.0	10.0	26.7	10.0
	Expl. text	56.7	53.3	---	26.7	6.7	20.0	6.7
	Author details	30.0	30.0	26.7	---	3.3	10.0	6.7
	Context.	10.0	10.0	6.7	3.3	---	6.7	3.3
	Image zoom	26.7	26.7	20.0	10.0	6.7	---	6.7
	Link related works	10.0	10.0	6.7	6.7	3.3	6.7	---
UK	**Image**	---	82.1	60.7	33.9	12.5	48.2	10.7
	Label	82.1	---	57.1	35.7	14.3	48.2	10.7
	Expl. text	60.7	57.1	---	32.1	12.5	35.7	10.7
	Author details	33.9	35.7	32.1	---	10.7	26.8	10.7
	Context.	12.5	14.3	12.5	10.7	---	10.7	7.1
	Image zoom	48.2	48.2	35.7	26.8	10.7	---	10.7
	Link related works	10.7	10.7	10.7	10.7	7.1	10.7	---
USA	**Image**	---	90.9	41.8	45.5	7.3	29.1	11.8
	Label	90.9	---	41.8	46.4	7.3	29.1	11.8
	Expl. text	41.8	41.8	---	24.5	6.4	17.3	9.1
	Author details	45.5	46.4	24.5	---	5.5	19.1	7.3
	Context.	7.3	7.3	6.4	5.5	---	2.7	3.6
	Image zoom	29.1	29.1	17.3	19.1	2.7	---	7.3
	Link related works	11.8	11.8	9.1	7.3	3.6	7.3	---

Finally, when taking a closer look at the educational resources, the first consideration to be made is that in all the cases, there is an important difference between the schedule and contact information and the rest of the educational resources. All countries present schedule and contact information in more than nine tenths of the sites with any educational resources. Publications within the Spanish sample are present in more than seven tenths of the sites with educational resources, while, in the British and American case, this percentage drops to three tenths and a fourth respectively. In-situ activities also have Spanish institutions on the top place, since more than a third of the ones with educational resources made them available for users. Less than a third and a fourth is the percentage of presence of these in-situ activities in the United Kingdom and the USA. If dealing with

virtual activities, however, British institutions and American ones implement them in more than a tenth of the sample with educational resources, while Spanish museums do it in less than a tenth. Exactly the same percentages are repeated by institutions of the United Kingdom and Spain when looking at the edutainment activities. The percentage for American museums, conversely, decreases significantly, reaching only slightly more than six per cent of the sample with any educational resources. Consequently, there are different general model of delivery of educational resources among the institutions from diverse country of origin.

Table 57
Type of educational resources percentage per country

	Germany %	Greece %	Spain %	United Kingdom %	USA %
Schedule and contact	93.3 (70.0)	100.0 (50.0)	90.9 (66.7)	100.0 (66.1)	95.8 (83.6)
Publications	6.7 (5.0)	100.0 (50.0)	72.7 (50.0)	29.7 (19.6)	27.1 (23.6)
In-situ activities	6.7 (5.0)	100.0 (50.0)	36.4 (26.7)	32.4 (21.4)	24.0 (20.9)
Virtual activities	6.7 (5.0)	0.0 (0.0)	9.1 (6.7)	13.5 (8.9)	13.5 (11.8)
Edutainment activities	6.7 (5.0)	0.0 (0.0)	9.1 (6.7)	13.5 (8.9)	7.3 (6.4)
Other	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	2.7 (1.8)	1.0 (0.9)

Note: Values in parentheses refer to the percentage of the total of the sample

Regarding the combination of the different educational resources, the German sample has a very specific character, because publications are not combined with anything and the rest of the features only present a case of combination in each category. Schedule and contact information and publications are both available in more than three fifths of the Spanish institutions. British and American cases, on the other hand, present a lower percentage, because this combination is available in three tenths and a fourth of the sample respectively. When dealing with schedule and contact information and in-situ activities, conversely, percentages of presence are more homogeneous, even though American institutions score ten percentage points less. Actually, British and Spanish institutions have both these features in about three tenths, whilst American ones have them in one fifth of the sample. The combination of schedule and contact information and virtual activities is less present than the previous ones, because only American and British institutions have a presence percentage above a tenth. Spanish cases with this combination are slightly less than a tenth. If edutainment activities are combined with schedule and contact information, Spanish and British percentages remain the same, American one, however, drops six percentage points. When the combination of publications and of in-situ activities is

analysed, Spanish institutions score the highest value of presence with more than three tenths. British and American cases, on the other hand, have the presence of this combination in a fifth and a tenth of the samples, respectively. Spanish institutions in all the rest of the combinations of publications, in-situ, virtual and edutainment activities score exactly the same percentage of slightly less than a tenth of the sample. Among the rest of the countries, only the United Kingdom has different combinations with a significant presence, even though it is only of a tenth when dealing with publications and edutainment activities or in-situ and edutainment activities and of less than a tenth when dealing with in-situ and virtual activities.

Table 58
Contingency table of the type of educational resources in percentage of the total by country

		Schedule and contact	Publications	In-situ activities	Virtual activities	Edutainment activities
Germany	**Schedule and contact**	---	0.0	6.7	6.7	6.7
	Publications	0.0	---	0.0	0.0	0.0
	In-situ activities	6.7	0.0	---	6.7	6.7
	Virtual activities	6.7	0.0	6.7	---	6.7
	Edutainment activities	6.7	0.0	6.7	6.7	---
Spain	**Schedule and contact**	---	63.6	31.8	9.1	9.1
	Publications	63.6	---	31.8	9.1	9.1
	In-situ activities	31.8	31.8	---	9.1	9.1
	Virtual activities	9.1	9.1	9.1	---	9.1
	Edutainment activities	9.1	9.1	9.1	9.1	---
UK	**Schedule and contact**	---	29.7	32.4	13.5	13.5
	Publications	29.7	---	21.6	5.4	10.8
	In-situ activities	32.4	21.6	---	8.1	10.8
	Virtual activities	13.5	5.4	8.1	---	2.7
	Edutainment activities	13.5	10.8	10.8	2.7	---
USA	**Schedule and contact**	---	25.0	22.9	13.5	7.3
	Publications	25.0	---	12.5	5.2	4.2
	In-situ activities	22.9	12.5	---	7.3	3.1
	Virtual activities	13.5	5.2	7.3	---	3.1
	Edutainment activities	7.3	4.2	3.1	3.1	---

In order to delimit and identify different profiles of implementation of the features between countries, the research is going to subsequently analyse the diverse association rules among features[57]. As done in the general analysis, the different searching options, the four main types of presentation of the collection and educational resources have been treated as consequents of the rules. Also these rules to be valid the same initial general requirements have been established. In other words, to validate the rules the minimum threshold requirements of support of the antecedent and of confidence of the rule itself are 15.0 and 95.0 per cent respectively[58].

Attending to the searching tools of the websites by country, the first main difference is that rules refer to diverse options according to the geographical origin. While among German and Spanish institutions the existing rules refer to the total absence of searching tools, British and American ones are related to a combination of searching tools exclusively. Looking at the German institutions, there are three basic rules that explain with total confidence the absence of any searching tool. Anyway, the percentage of support of the antecedents varies on each rule. The very first rule of the German institutions is the one with highlights, images, labels, explaining texts and no educational resources as antecedents for the absence of any searching tools. These antecedents are present in a 20.0 per cent of the German sample and, as the confidence is total, the support of the rule has the same percentage. Similarly, German art museums with catalogues, highlights, images, labels and explaining texts represent 15.0 per cent of the sample of this country and all of them do not have any searching tool. Equal percentages of presence and confidence are present among German institutions tagged as others, with highlights, images, explaining texts and educational resources, but no in-situ, virtual, edutainment or other type of educational resources. Regarding British institutions, there is no rule that fulfils the two thresholds. Anyway, lowering the minimum presence of the antecedents, a basic rule with a combination of searching tools as consequent can be identified. In fact, a 14.3 per cent of the British institutions present as antecedents catalogues, databases, highlights, images, labels, explaining texts, image zoom and schedule and contact information of the education department, but no publications. All these institutions have as a consequent a combination of searching tools. The presence of the antecedents decreases to 12.5 per cent if

[57] Only strong linear relations will be mentioned on the analysis.

[58] In some cases, these requirements have been lowered in order to find some rules. In this case, the change of the minimum threshold will be explicitly stated. In some other cases, due to the absence of rules or to the great importance of them, some rules will not fulfil these thresholds, but will also be explicitly stated.

collections, author details and no edutainment activities are added and to 10.7 per cent if only art museums with contextualization information and no other educational resources are analysed, but the percentage of confidence remains the same. When the lowered threshold is the confidence one, another rule is identified among British institutions. In this case, 21.4 per cent of them have databases, collections, images, labels, author details and image zoom as antecedents and, in 91.7 per cent of these cases, they present a combination of searching tools, placing the percentage of support of the rule in 19.6 per cent of the sample. This rule can also further include explaining texts, schedule and contact information and no publications, but the percentages drop to 19.6 per cent of support of the antecedents, 90.9 per cent of confidence and 17.9 per cent of support of the rule. Analysing the American institutions, the presence threshold has to be lowered even below 10.0 per cent to find a valid rule. This rule states that in all the websites of American art museums with databases, highlights, labels and schedule and contact information, but no in-situ, virtual and other type of educational resources as antecedents, which represent 9.1 per cent of the sample, there is a combination of searching tools as a consequent. Finally, as mentioned before, Spanish institutions are the only ones that present a rule for the absence of any searching tool, even though in this case the support percentage of the rule has been lowered to 10.0 per cent. Among the analysed Spanish institutions, 12.9 per cent of them have highlights and no educational resources and in all the cases there is an absence of any searching tool as a consequence.

Table 59
Summary of the main basic rules regarding the searching options by country

Country	Consequent	Antecedents	% of support	% of confidence	% of support of the rule
Germany	Searching tool - None	Highlights Images Labels Explaining texts No educational resources	20.0	100.0	20.0
Germany	Searching tool - None	Art museums Catalogues Highlights Images Labels Explaining texts	15.0	100.0	15.0
Germany	Searching tool - None	Other institutions Highlights Images Explaining texts Educational resources No in-situ activities No virtual activities No edutainment activities No other educational activities	15.0	100.0	15.0
United Kingdom	Searching tool - Combined	Catalogues Databases Highlights Images Labels Explaining texts Image zoom Schedule and contact No publications	14.3	100.0	14.3
Spain	Searching tool - None	Highlights No educational resources	12.9	100.0	12.9
USA*	Searching tool - Combined	Art museums Databases Highlights Labels Schedule and contact No in-situ activities No virtual activities No other educational activities	9.1	100.0	9.1
United Kingdom**	Searching tool - Combined	Databases Collection Images Label Author details Image zoom	21.4	91.7	19.6

Notes: * Support requirement lowered to 5.0%
** Confidence requirement lowered to 90.0%

If catalogues are the analysed features, all countries, except for the USA, have two rules that fulfil the minimum requirements. Among the American institutions, the support threshold has been lowered to find a valid rule. In fact, 10.9 per cent of the cases are art museums with databases, images, labels, explaining texts and author details that present catalogues as a consequence in all the cases. If author details are extracted from this rule, the support of the antecedents increases to 11.8 per cent, but the confidence percentage drops to 92.3 per cent and, consequently, the support of the rule to 10.9 per cent. On the other hand, two rules are identified among the German sample. First of all, 45.0 per cent of the institutions are art museums with highlights, images, labels and explaining texts and all of them have as a consequent catalogues. Only the support percentage decreases to 30.0 per cent if the absence of any searching tool and author details are included among the antecedents, because the percentage of the confidence remains the same. The second basic rule has collections, images and labels as antecedents. The support of this combination of antecedents is 35.0 per cent and the degree of confidence of 100.0 per cent. The presence of the antecedents decreases five percentage points if highlights and educational resources are added and only art museums analysed, but the confidence is still total. It is also remarkable that if highlights or databases are added separately to the second basic German rule, the confidence percentage remains the same, but the one of support of the antecedents drops to 25.0 per cent.

Looking at the British and Spanish institutions, there is a rule with collections, images, labels and author details as antecedents and catalogues as a consequent. These antecedents are present in 30.0 per cent and 29.0 per cent of both samples respectively and the confidence of the rule is total. The second basic rule in these two countries is very similar, but it has a slight difference. While the antecedents in the British case consist of art museums with databases, collection, images and labels, among the Spanish ones the presence of educational resources is also included without detriment for the support of the antecedent. The percentage of confidence of these rules is total, but the support one is 26.7 per cent and 22.6 per cent respectively. The further addition of other features in this rule decreases the support of the antecedents, but maintains the percentage of confidence.

Table 60
Summary of the main basic rules regarding catalogues by country

Country	Consequent	Antecedents	% of support	% of confidence	% of support of the rule
Germany	Catalogues	Art museums Highlights Images Labels Explaining texts	45.0	100.0	45.0
Germany	Catalogues	Collection Images Labels	35.0	100.0	35.0
United Kingdom	Catalogues	Collection Images Labels Author details	30.0	100.0	30.0
Spain	Catalogues	Collection Images Labels Author details	29.0	100.0	29.0
United Kingdom	Catalogues	Art museums Databases Collection Images Labels	26.7	100.0	26.7
Spain	Catalogues	Art museums Databases Collection Images Labels Educational resources	22.6	100.0	22.6
USA*	Catalogues	Art museums Databases Images Labels Explaining texts Author details	10.9	100.0	10.9

Note: * Support requirement lowered to 10.0%

Analysing databases as a consequent, **British rules are the most significant ones**. The first basic British rule has a support of the antecedents of more than half of the sample. Actually, 51.8 per cent of the British institutions have collections, labels and educational resources as an antecedent and all of them present databases as a consequent. If images are added to this rule, only the support percentage decreases, but it is still exactly of half of the sample. The inclusion of different features in these rules decreases the support of the antecedents, but in all cases the confidence degree remains total. Another rule can be identified among British institutions taking a combination of different searching tools, images, labels and the presence of educational resources as antecedents. 37.5 per cent of the sample have these antecedents and in every case they have databases as a consequent.

Taking this rule as a basis, collection and catalogues can be included among the antecedents separately, dropping only their support percentage to 30.4 and 28.6 per cent respectively. If these two features are included simultaneously, however, the support decreases to 26.8 per cent of the sample. The last rule[59] states that, among British museums, 32.1 per cent are art museums with images, labels and some educational resources and that all of them present databases as well on their websites. The addition of catalogues to the antecedents implies a decrease of the support percentage of them to 25.0 per cent, whilst the confidence degree still remains total.

Regarding the rest of the countries, Germany presents the rule with the highest support, because one out of five institutions is an art museum with catalogues, collection, images, labels and educational resources, which in all cases have databases as a consequence. If highlights, explaining texts, author details and educational resources are added to the antecedents, the confidence remains total, but the support percentage decreases to 15.0 per cent. Another rule has been identified among German institutions. Websites with a combination of searching tools, catalogues, highlights, collection, images and label suppose the 15.0 per cent of the German sample and they have always implemented a database as well. Attending to the American sample, there is only one rule that fulfils the minimum requirements. This rule affirms that American institutions with a combination of searching tools, labels and author details also present a database on their website. The support percentage of the antecedents is 16.4 per cent and the confidence of the rule total. When including only art museums and the presentation of images among the previous antecedents, the confidence of the rule is still 100.0 per cent, but the support of the antecedents drops to 15.5 per cent. Spain is the only case in which the support threshold of the antecedents has to be lowered below 15.0 per cent to find any valid rule. In fact, art museums with advanced searching tools, catalogues, collection, images, labels and educational resources represent 12.9 per cent of the Spanish sample and in all cases they have databases as a consequent. The addition of other features to the rule maintains the confidence the same, but the support of the antecedents decreases below 10.0 per cent.

[59] There are many more rules among British museums, but only these ones have been selected, due to the support of the antecedents of the basic rule over 30.0%.

Table 61
Summary of the main basic rules regarding databases by country

Country	Consequent	Antecedents	% of support	% of confidence	% of support of the rule
United Kingdom	Databases	Collection Labels Educational resources	51.8	100.0	51.8
United Kingdom	Databases	Searching tool – Combined Images Labels Educational resources	37.5	100.0	37.5
Germany	Databases	Art museums Catalogues Collection Images Labels Educational resources	20.0	100.0	20.0
USA	Databases	Searching tool – Combined Labels Author details	16.4	100.0	16.4
Germany	Databases	Searching tool – Combined Catalogues Highlights Collection Images Labels	15.0	100.0	15.0
Spain*	Databases	Art museums Searching tool – Advanced Catalogues Collection Images Label Educational resources	12.9	100.0	12.9

Note: * Support requirement lowered to 10.0%

Looking at the presentation of highlights as a consequent, Germany is the country where rules present the highest percentages of support of the antecedents. In fact, the first basic rule has a support of 70.0 per cent and a confidence of 100.0 per cent. This rule states that websites with an absence of searching tools and the delivery of images present highlights of their collections in all the cases. If the antecedents observed are the presence of images and explaining texts, similarly, the support percentage is of 65.0 per cent. In both cases, the inclusion of labels among the antecedents makes their support percentage drop five percentage points, while the confidence degree remains immovable. Equally, the combination of all the above mentioned features in the antecedents gives as a result a rule with a support of the antecedents of 45.0 per cent and total confidence. The addition of any further antecedent in any of these three rules lowers the percentage of support, but does not affect to the confidence of the rule at all. Taking a closer look at British museums, conversely, there are two identifiable main rules. The most statistically significant one

affirms that all art museums with a combination of searching tools, catalogues, images and labels also present a selection of the highlights of their collections on the websites. The support of this rule with total confidence is 21.4 per cent. If collection and databases are added separately to this basic rule, the support of the antecedents decreases to 19.6 per cent, but there is no alteration of the confidence degree. Their joint inclusion gives as a result a support of the antecedents of 17.9 per cent. The other basic rule regarding British museums remarks that all art museums with catalogues, databases, images, labels, explaining texts, author details and image zoom present the highlights of their holdings. These antecedents and, due to the total confidence, also the support of this rule suppose 17.9 per cent of the British sample.

In order to find some rules among American and Spanish museums, however, the support threshold has been lowered to 5.0 per cent, because there is none that fulfil the original minimum requirements. Among institutions from the USA, there is a rule that takes place in 8.2 per cent of the sample, which declares that, in all websites of art museums with combined searching tools, images, labels and explaining texts, there is a presentation of the highlights of the holdings. Regarding the Spanish case, there are two rules with a support of the antecedents of 6.5 per cent and a total confidence of the rule. The antecedents of each rule are the presence of a combination of searching tools, catalogues, collection, exhibitions, images, labels, image zoom and educational resources in art museums on the one hand and the presence of catalogues, databases, collection, exhibitions, virtual museums, images, labels, image zoom and educational resources on the other.

Table 62
Summary of the main basic rules regarding presentation of highlights by country

Country	Consequent	Antecedents	% of support	% of confidence	% of support of the rule
Germany	Highlights	Searching tool – None Images	70.0	100.0	70.0
Germany	Highlights	Images Explaining texts	65.0	100.0	65.0
Germany	Highlights	Searching tool – None Images Labels Explaining texts	45.0	100.0	45.0
United Kingdom	Highlights	Art museums Searching tool – Combined Catalogues Images Labels	21.4	100.0	21.4
United Kingdom	Highlights	Art museums Catalogues Databases Images Labels Explaining texts Author details Image zoom	17.9	100.0	17.9
USA*	Highlights	Art museums Searching tool – Combined Images Labels Explaining texts	8.2	100.0	8.2
Spain*	Highlights	Art museums Searching tool – Combined Catalogues Collection Exhibitions Images Labels Image zoom Educational resources	6.5	100.0	6.5
Spain*	Highlights	Catalogues Databases Collection Exhibitions Virtual museums Images Labels Image zoom Educational resources	6.5	100.0	6.5

Note: * Support requirement lowered to 5.0%

If the analysed feature as consequence is the presentation of a great part or the whole collection, Spain is the country that presents the basic rule with the highest values of support among those with a total confidence. Actually, the basic rule of the Spanish

museums affirms that 45.1 per cent of them have catalogues, images and labels as antecedents for the presence of a great part of the collection in all the cases. The support of the antecedents drops to 41.9 and 38.7 per cent if art museums or educational resources are added respectively. The joint addition of these two features lowers the presence of the combination of antecedents to 35.5 per cent. When explaining texts or author details are added separately to the basic rule, the percentage of presence of the antecedents and, consequently, of the support of the rule decreases to 32.3 and 29.0 per cent respectively. Finally, the inclusion of art museums and databases among the antecedents of the basic rule of Spain drops their support to 25.8 per cent, but the degree of confidence of the rule remains total.

German institutions, on the other hand, have two basic rules with a confidence of 100.0 per cent. First of all, German websites with catalogues, databases, images and labels represent a fourth of the sample and all of them present a great part of the collection. The second rule has a combination of searching tools, catalogues, images and labels. This rule has a support of the antecedents of a 20.0 per cent and a confidence of 100.0 per cent. Looking at the British sample, there is no rule with a total confidence, but there are two basic rules that fulfil the minimum requirements. The first one is the rule with databases, labels and educational resources as antecedents. 53.6 per cent of the sample have these antecedents and, as the confidence of the rule is of 96.7 per cent, the support of the rule is of 51.8 per cent. When images are added to this basic rule, the support of the antecedents drops to 51.8 per cent, the confidence to 96.6 and, consequently, the support of the rule to 50.0 per cent. The second British rule differs slightly from the first one. In this case, the basic antecedents are the combination of searching tools and the use of labels, which are present in 48.2 per cent of the sample. Since the confidence of the rule is of 96.3 per cent, the support of the rule is of 46.4 per cent. If databases and images are added separately to the antecedents, in both cases the support of the antecedents represents 46.4 per cent and the confidence percentage is of 96.2 per cent. Consequently, the support of the rule in both cases is of 44.6 per cent. If these two features are added together, conversely, the support percentage decreases to 44.6 per cent, the percentage of confidence to 96.0 per cent and, logically, the support of the rule to 42.9 per cent. Analysing the American sample, finally, the confidence threshold has been lowered to 90.0 per cent to find any rule. The most basic rule has a combination of searching tools, images and labels as antecedents for the presentation of a great part of the collection. These antecedents take place in 23.6 per cent

of the sample and the confidence of the rule is 92.3 per cent, situating the support of the rule in 21.8 per cent. The inclusion of catalogues among the antecedents drops the support to 16.4 per cent, but increases the confidence of the rule to 94.4 per cent. Consequently, the support of this rule is 15.5 per cent. The substitution of labels by databases in this last option maintains the three percentages the same. Lastly, not the substitution, but the addition of databases represents 15.5 per cent of the sample, but as the confidence of the rule decreases slightly to 94.1 per cent, the global support of the rule drops to 14.5 per cent.

Table 63
Summary of the main basic rules regarding presentation of the collection by country

Country	Consequent	Antecedents	% of support	% of confidence	% of support of the rule
Spain	Collection	Catalogues Images Labels	45.1	100.0	45.1
Germany	Collection	Catalogues Databases Images Labels	25.0	100.0	25.0
Germany	Collection	Searching tool – Combined Catalogues Images Labels	20.0	100.0	20.0
United Kingdom	Collection	Databases Labels Educational resources	53.6	96.7	51.8
United Kingdom	Collection	Searching tool – Combined Labels	48.2	96.3	46.4
USA*	Collection	Searching tool – Combined Images Labels	23.6	92.3	21.8

Note: * Confidence requirement lowered to 90.0%

The last area of identification of association rules for this research is the one of the presence of any educational resource on the website. In this case, none of the minimum requirements has to be modified, because all the countries have at least one rule fulfilling them. Among all the rules with a total confidence degree, the Spanish one presents the highest support percentage of the antecedents. In fact, 38.7 per cent of the Spanish sample has images and exhibitions and all of them have educational resources on the websites. The inclusion of labels among the antecedents drops the support to 35.5 per cent, while the confidence is still 100.0 per cent. Attending to the German institutions, there are two rules with exactly the same values of support and confidence. These two rules have a support of the antecedents of 20.0 per cent and a confidence of 100.0 per cent. The first one of these

rules states that all German institutions with catalogues, highlights, collection, images, labels and explaining texts have any educational resources. Similarly, also all German art museums with catalogues, databases, collection, images and labels present educational resources on their websites. The combination of all the features of these two rules is present in 15.0 per cent of the sample, but the confidence degree is still total. Analysing the institution from the USA, there are two different basic rules. The first one has a support of the 24.5 per cent and a confidence of 96.3 per cent, defining a support of the rule of 23.6 per cent. The antecedents of this rule are the presence of a simple searching tool, images and labels. On the other hand, the presentation of labels and author details as antecedents is identified in 46.4 per cent of the American sample and in 96.1 per cent of these cases there are also educational resources on the websites. Consequently, the support of the rule scores a 44.5 per cent. Furthermore, if art museum and images are added to this second rule separately, two variants of this rule can be identified. In both cases, the support of the antecedents is of 45.5 per cent and the confidence of the rule of 96.0 per cent. Therefore, the support of these variants of the rule is of 43.6 per cent. The inclusion of the combination of these two features among the antecedents of the basic rule decreases their support to 44.5 per cent and the confidence of the rule to 95.9 per cent. Thus, the support of this rule among American institutions of the sample is of 42.7 per cent. Finally, among British institutions of the sample, there is a basic rule that fulfils both minimum requirements. The presence of catalogues, databases, collection, images and labels takes place in 37.5 per cent of the British sample and 95.2 per cent of these cases have any educational resources on their websites. Consequently, the support of the rule within the sample of institutions from the United Kingdom is of 35.7 per cent. When the presentation of highlights is added to the previous antecedents, the percentage of support, confidence and support of the rule drop to 32.1, 94.4 and 30.4 per cent respectively.

Table 64
Summary of the main basic rules regarding the presence of the educational resources by country

Country	Consequent	Antecedents	% of support	% of confidence	% of support of the rule
Spain	Educational resources	Images Exhibitions	38.7	100.0	38.7
Germany	Educational resources	Catalogues Highlights Collection Images Labels Explaining texts	20.0	100.0	20.0
Germany	Educational resources	Art museums Catalogues Databases Collection Images Labels	20.0	100.0	20.0
USA	Educational resources	Searching tool – Simple Images Labels	24.5	96.3	23.6
USA	Educational resources	Labels Author details	46.4	96.1	44.5
United Kingdom	Educational resources	Catalogues Databases Collection Images Labels	37.5	95.2	35.7

4.1.9.- Correlation by type of institution

The third premise of the research states that corporate values of the institutions influence the model of implementation of web technologies with their cultural contents. According to this assumption, the following section deals with the analysis of the various features and combinations, but identifying similarities and differences taking into account the type of institution analysed[60]. As happens with the analysis by country of origin, the explanations will be mainly based on the patterns of implementation of each type of institution in order to be able to highlight potential similarities and differences among them.

Looking at the country of origin of the cases by type of institution, it is crucial to bear in mind that half of the institutions are American and another fourth British. Thus, these two countries score the highest value in each category of institution. In fact, American institutions represent nearly three fifths of the sample of art museums and nearly half when analysing history ones. Surprisingly, British institutions score the lowest value in this

[60] In this analysis cultural sites are not taken into consideration, because there are only two entries on the whole sample.

second category, with only slightly more than a tenth. German and Spanish museums represent each one a fifth of the sample of these museums. Anthropology museums of this sample, conversely, only come from the United Kingdom, as well as two thirds from the archaeology ones. The other third of the sample of the archaeology museums is represented by Spanish institutions.

Table 65
Country of origin percentage per type of institution

	Art museums %	History museums %	Anthrop. museums %	Archaeo. museum %	Cultural sites %	Other %
Germany	8.1	20.0	0.0	0.0	0.0	15.0
Greece	0.6	0.0	0.0	0.0	0.0	5.0
Spain	12.2	20.0	0.0	33.3	50.0	20.0
United Kingdom	20.3	13.3	100.0	66.7	50.0	50.0
USA	58.7	46.7	0.0	0.0	0.0	10.0

Analysing the type of digital resources delivered by each type of institution, the findings follow a similar pattern to the general one, because, in all the analysed divided samples, museums with both digital collections and educational resources are more numerous than the ones with merely digital collections on their websites. The variation of percentages, however, is substantial and deserves a closer analysis. The most extreme case is the one of archaeology museums, where all institutions have also educational resources on their websites. The difference of institutions with only digital collections and the ones with both types of the resources is of about sixty and fifty percentage points respectively in art and anthropology museums. Attending to history museums, finally, websites with educational resources have a higher percentage than those ones with only digital collections, but in this case the difference between them is around six percentage points only. Consequently, the variation of the difference by type of institutions ranges from only six to sixty points and in the case of archaeology museums there are no institutions with simply digital collections.

Table 66
Type of digital resources percentage per type of institution

	Art museums %	History museums %	Anthrop. museums %	Archaeo. museum %	Cultural sites %	Other %
Digital collection	20.3	46.7	25.0	0.0	100.0	20.0
Educational resources	0.0	0.0	0.0	0.0	0.0	0.0
Both	79.7	53.3	75.0	100.0	0.0	80.0

Taking a closer look at the different searching tools by types of institution, it can be identified a diversity of patterns of implementation. Firstly, more than four tenths of art museums and four tenths of the history ones have a complete absence of searching tools for the cultural contents of their websites. A third of the archaeology museums, similarly, do not have any searching tool on the websites. Anthropology museums are the only type of institution not only with no case with absence of searching options, but also with an absence of a simple or advanced searching tool. Regarding the simple searching tool, once again art museums are the ones with the highest percentage, representing nearly a fifth of all the institutions of this category. The percentage of archaeology museums with simple searching tools is about sixteen per cent, but, when dealing with history museums, it drops to more than six per cent of the cases. The percentage of these two last categories of institutions remains the same if the analysed searching option is the advanced one. Nevertheless, percentage for art museums decreases significantly, since only four cases out of a hundred present any advanced searching tool. Analysing the degree of implementation of complex searching tools, only art and anthropology museums have them, even if their percentage of use is very different. While only three out of a hundred art museums present a complex searching tool, three fourths of the anthropology ones do it. Finally, the combination of different searching tools is present in all types of institutions. In this case, anthropology museums score the lowest value with only a fourth of presence, followed by art museums with three tenths. Archaeology museums combine different searching tools in a third of their sample and history museums develop a combined searching option in slightly less than half of the cases. If searching tools are grouped, the absence of any tool and the simplest ones are present in three fifths of the art museums, half of the archaeology ones and slightly less than half of the cases of history museums. No anthropology museum can be identified within this group of searching tools. Attending to the most advanced tools, conversely, all anthropology museums are inserted within this category of searching options. History museums present any of these options in slightly more than half of the cases, whilst archaeology ones do it in exactly half of the sample. Finally, something more than a third of the art museums have any more advanced searching option, scoring the lowest value of all types of institutions. Consequently, there are different patterns for the implementation of searching tools according to the diverse categories of institutions. While history and archaeology museums represent a more

balanced model, art and anthropology ones have a clear disequilibrium towards more simple and more advanced searching options respectively.

Table 67
Degree of searching tool percentage per type of institution

	Art museums %	History museums %	Anthrop. museums %	Archaeo. museum %	Cultural sites %	Other %
None	43.6	40.0	0.0	33.3	100.0	55.0
Simple	19.2	6.7	0.0	16.7	0.0	5.0
Advanced	4.1	6.7	0.0	16.7	0.0	10.0
Complex	3.5	0.0	75.0	0.0	0.0	0.0
Combined	29.7	46.7	25.0	33.3	0.0	30.0

Regarding the implementation of diverse features to present the digital collections, there are significant differences between the categories of institutions. More than half of the history museums present their collections through browsable catalogues. Nearly half of the art ones, similarly, permit to browse the holdings of the institution by means of digital catalogues. If archaeology museums are the analysed ones, the presence of catalogues drops to a third and this decrease continues until reaching only a fourth of presence among anthropology museums. The pattern of implementation of databases, on the other hand, is the opposite, since all anthropology museums have them in order to present their contents, as well as half of the archaeology museums. History museums do not reach this last percentage of implementation and four out of ten art ones have implemented databases to search their contents. Looking at the degree of the presented amount of the collection, history and archaeology museums follow a contrary pattern of presentation. In fact, while the first ones have a higher percentage of presentation of a great part of the collection, archaeology ones have a higher presence of highlights. In both cases, anyhow, the feature with the lowest presence has a percentage of around half of the sample and the one with the highest value has a presence in three fifths of history museums and two thirds of the archaeology ones respectively. Looking at art museums, on the other hand, both features have a percentage of presence higher than three fifths. Anthropology museums, conversely, have a completely opposite and more extreme pattern, because all of them present all or a great part of the collection and no highlights. These museums, moreover, are the ones that implement in a higher degree digital exhibitions and virtual museums, because both features are present in a fourth of the sample. Archaeology and art museums have digital exhibitions on their websites in about sixteen per cent of the institutions of the sample. The last significant implementation is the one of virtual museums by art museums, even

though its presence does not reach a tenth of the correspondent sample. Consequently, also the type of presentation of the collection reflects different implementation models according to the diverse categories of institutions analysed.

Table 68
Type of presentation of the collection percentage per type of institution

	Art museums %	History museums %	Anthrop. museums %	Archaeo. museum %	Cultural sites %	Other %
Catalogues	48.3	53.3	25.0	33.3	0.0	50.0
Database	40.7	46.7	100.0	50.0	0.0	30.0
Highlights	64.5	46.7	0.0	66.7	50.0	75.0
Collections	61.0	60.0	100.0	50.0	0.0	45.0
Exhibitions	16.3	6.7	25.0	16.7	0.0	20.0
Virtual museum	8.1	0.0	25.0	0.0	50.0	10.0
Reconstr.	0.6	0.0	0.0	0.0	0.0	0.0
Immersive environment	0.0	0.0	0.0	0.0	0.0	0.0
Other	0.6	0.0	0.0	16.7	50.0	5.0

Attending to the different combinations of the presentation of the collection, diverse patterns can be identified among different types of institutions[61]. Looking at the global overall presence of catalogues and databases, history museums are the ones with a higher value of this combination, because two out of five cases have it. Archaeology museums, on the other hand, combine these features in one out of three cases, while art museums have it in three tenths of them. Finally, a fourth of anthropology museums present both catalogues and databases on their websites. When dealing with the combination of catalogues and highlights, archaeology museums present it in a third of the sample and art ones in three tenths of the cases. This percentage decreases to slightly more than a tenth in history museums, while in anthropology ones, due to the absence of highlights, there is no institution with this combination. The distribution of catalogues and collections can be described as more homogeneous, with the lowest value in anthropology museums, being of a fourth. A third of archaeology museums have both these features. Two fifths of history museums combine both catalogues and collections, whilst art museums rank slightly below this percentage. The combination of databases and highlights is present in a lower degree among art and history museums, but in the same degree among archaeology ones. In fact, a third of the latter ones present this combination, while less than a fourth and more than a tenth of art and history museums respectively have these two features together on their

[61] Due to the overall low number of the links to related news, this feature will not be analysed in this section.

websites. The pattern with the combination of databases and collection is similar, with the exception that in this case all anthropology museums have it. Similarly, half of the archaeology museums present this combination, while about a third of art ones and exactly a third of the history ones do it. It is remarkable that a fourth of anthropology museums combine databases with digital exhibitions. Taking a closer look to the combination of the presentation of highlights and a great part of the collection, once again a third of the archaeology museums present it, while slightly more than a fourth and about thirteen per cent of art and history museums respectively have it. Less than seventeen per cent of the archaeology museums combine highlights with digital exhibitions and about a tenth of the art museums. Finally, when looking at the combination of the presentation of a great part of the collection and digital exhibitions, a fourth of anthropology museums and 14.0 per cent of the art ones display this combination on their websites.

Table 69
Contingency table of the digital collection in percentage of the total by type of institution

		Catalogue	Database	Highlights	Collection	Exhibitions
Anthrop. museums	**Catalogue**	---	25.0	0.0	25.0	0.0
	Database	25.0	---	0.0	100.0	25.0
	Highlights	0.0	0.0	---	0.0	0.0
	Collection	25.0	100.0	0.0	---	25.0
	Exhibitions	0.0	25.0	0.0	25.0	---
Archaeo. museums	**Catalogue**	---	33.3	33.3	33.3	0.0
	Database	33.3	---	33.3	50.0	0.0
	Highlights	33.3	33.3	---	33.3	16.7
	Collection	33.3	50.0	33.3	---	0.0
	Exhibitions	0.0	0.0	16.7	0.0	---
Art museums	**Catalogue**	---	30.8	30.8	38.4	9.9
	Database	30.8	---	23.8	37.2	8.7
	Highlights	30.8	23.8	---	27.3	11.6
	Collection	38.4	37.2	27.3	---	14.0
	Exhibitions	9.9	8.7	11.6	14.0	---
History museums	**Catalogue**	---	40.0	13.3	40.0	0.0
	Database	40.0	---	13.3	33.3	6.7
	Highlights	13.3	13.3	---	13.3	6.7
	Collection	40.0	33.3	13.3	---	0.0
	Exhibitions	0.0	6.7	6.7	0.0	---

If the presentation of the content is analysed by the different categories of institution, the differences on the use of the features are evident. Firstly, all institutions, except for anthropology museums, have images in more than nine tenths of the sample. Actually, all archaeology museums have them. Nevertheless, anthropology museums use images to present their contents in half of the sample. Attending to labels, however, all anthropology museums deliver this kind of features to present their contents. Percentages of archaeology

and history museums, conversely, drop to four fifths and slightly less than three fourths respectively. In fact, history museums score the lowest value of institutions that implement any feature other than images. When dealing with the use of explaining texts on the websites, archaeology museums do it in four out of five cases and anthropology ones in three out of four. Besides, more than half of the art museums present them. This feature is used by a third of the history museums. The percentage of presence of the author details decreases slightly, because archaeology museums are the institutions that adopt them most extensively, although their use takes place in only half of the sample. Similarly, author details are also present in nearly 46.0 per cent of the art museums. History museums, on the other hand, make use of this feature in one tenth. The same percentage is present also on the use of image zooming options by history museums and contextualization information by art museums. These two features are also implemented in one fourth of the cases from anthropology museums. Additionally, image zooming options are present in one third and one fifth of art and archaeology museums respectively. Finally, the last significant presence is the one of the links to related works among art museums. Nearly sixteen per cent of the institutions link their contents to related works. In fact, only art museums use this kind of links to other related works. Consequently, the presentation of the contents of the institution is made using different features depending on the character of the museum. Therefore, there are different models of use of the features to present the digital contents related to diverse categories of institutions.

Table 70
Type of presentation of the content percentage per type of institution

	Art museums %	**History museums %**	**Anthrop. museums %**	**Archaeo. museum %**	**Cultural sites %**	**Other %**
Image	96.5	93.3	50.0	100.0	100.0	90.0
Label	95.3	73.3	100.0	80.0	50.0	75.0
Explaining text	51.2	33.3	75.0	80.0	0.0	70.0
Author details	45.9	13.3	50.0	0.0	0.0	20.0
Context.	11.6	0.0	25.0	0.0	50.0	0.0
Image zoom	34.3	13.3	25.0	20.0	0.0	35.0
Link related works	15.8	0.0	0.0	0.0	0.0	0.0
Link related news	2.9	0.0	0.0	0.0	0.0	0.0
Other	3.5	6.7	0.0	20.0	0.0	5.0

Looking at the combination of diverse features to present the contents, there are identifiable differences among institutions[62]. In fact, the combination of images and labels takes place in more than nine tenths of the art museums, but in only half of the anthropology ones. Four out of five and two out of three archaeology and history museums respectively combine both these features on their websites. When dealing with the joint presentation of images and explaining texts, the percentage of archaeology museums remain the same, while the rest of the cases decrease significantly. Actually, a third of the history museums and a fourth of the anthropology ones have this combination, exactly half of the percentage of cases with images and labels in both cases. Also among the art museums the decrease is important, even though in this case the joint presentation of the features takes place in slightly more than half of the sample. Regarding the combination of labels and explaining texts, three fifths of the archaeology museums present it and nearly half of the art ones. The percentage of history and anthropology museums with the presentation of both labels and explaining texts is slightly superior to a fourth and exactly this value respectively. Analysing the combination of images and author details, more than 45.0 per cent of the art museums present it, a fourth of the anthropology ones and about thirteen per cent of the history ones. Archaeology museums, conversely, do not have nor author details, neither contextualization information. Attending to the combination of labels and author details, anthropology museums are the ones with the highest presence, because this combination takes place in half of the sample. Art and history museums, on the other hand, combine these features in about sixteen and thirteen per cent of the sample, respectively. Also half of the anthropology museums present both explaining texts and author details, but among art museums the presence increases to three tenths of the sample. Among history museums, however, the presence drops to below a tenth of the cases. Contextualization information is only present in anthropology and art museums. Among the first ones, a quarter of the sample combines this information with labels or explaining texts. Art museums, conversely, combine it with all the rest of the features, but only in the case of images and labels the presence is higher than a tenth of the sample. Analysing the combination of image zoom, anthropology and archaeology museums present it only jointly to images or labels in a fourth and a fifth of the sample respectively. Art and history museums, on the other hand, combine it with all the features, but in different degrees. In fact, more than thirteen per cent of the history museums do it with

[62] Due to the overall low number of the links to related news, this feature will not be analysed in this section. Moreover, among archaeology museums one case has been disregarded from this analysis, due to the absence of any feature for the presentation of the contents.

images, labels or author details and not even a tenth with explaining texts. Looking at art museums, the lowest presence of combination is with author details, which takes place in more than a fifth of the cases, while the highest one is with images or labels in more than a third of the sample in both cases. Finally, only art museums present links to related works in combination with other features in about a tenth of the sample in all cases, except for contextualization information where the percentage drops to a five per cent.

Table 71
Contingency table of type of presentation of the collection in percentage of the total by type of institution

		Image	Label	Expl. text	Author details	Context.	Image zoom	Link related works
Anthrop. museums	**Image**	---	50.0	25.0	25.0	0.0	25.0	0.0
	Label	50.0	---	25.0	50.0	25.0	25.0	0.0
	Expl. text	25.0	25.0	---	50.0	25.0	0.0	0.0
	Author details	25.0	50.0	50.0	---	0.0	0.0	0.0
	Context.	0.0	25.0	25.0	0.0	---	0.0	0.0
	Image zoom	25.0	25.0	0.0	0.0	0.0	---	0.0
	Link related works	0.0	0.0	0.0	0.0	0.0	0.0	---
Archaeo. museums	**Image**	---	80.0	80.0	0.0	0.0	20.0	0.0
	Label	80.0	---	60.0	0.0	0.0	20.0	0.0
	Expl. text	80.0	60.0	---	0.0	0.0	0.0	0.0
	Author details	0.0	0.0	0.0	---	0.0	0.0	0.0
	Context.	0.0	0.0	0.0	0.0	---	0.0	0.0
	Image zoom	20.0	20.0	0.0	0.0	0.0	---	0.0
	Link related works	0.0	0.0	0.0	0.0	0.0	0.0	---
Art museums	**Image**	---	91.9	50.6	45.3	11.6	34.3	12.8
	Label	91.9	---	49.4	15.9	11.6	34.3	12.8
	Expl. text	50.6	49.4	---	30.8	9.3	23.3	10.5
	Author details	45.3	15.9	30.8	---	8.1	21.5	9.3
	Context.	11.6	11.6	9.3	8.1	---	7.0	5.2
	Image zoom	34.3	34.3	23.3	21.5	7.0	---	9.3
	Link related works	12.8	12.8	10.5	9.3	5.2	9.3	---
History museums	**Image**	---	66.7	33.3	13.3	0.0	13.3	0.0
	Label	66.7	---	26.7	13.3	0.0	13.3	0.0
	Expl. text	33.3	26.7	---	6.7	0.0	6.7	0.0
	Author details	13.3	13.3	6.7	---	0.0	13.3	0.0
	Context.	0.0	0.0	0.0	0.0	---	0.0	0.0
	Image zoom	13.3	13.3	6.7	13.3	0.0	---	0.0
	Link related works	0.0	0.0	0.0	0.0	0.0	0.0	---

When dealing with educational resources analysed by the different types of institutions, also here museums present diverse models of use of these resources. As happens on the other analyses, schedule and contact information for the educational resources is the most present feature, but its percentage ranges from the total in anthropology museums to above

four fifths in archaeology ones of those with any educational resource. Almost all art museums present schedule and contact information and nearly nine tenths of history museums with educational resources do it. The delivery of publications on the websites drops significantly in art museums, where only a quarter of the sample with educational resources has them. Two thirds of anthropology and archaeology museums of those with educational resources present online publications on their sites. History museums are the ones with the highest use of publications, because three out of four cases make them available for their users. The availability of in-situ activities on the website of the institutions follows exactly the same pattern of use among the museums, since again history museums are the ones with a higher percentage of use and art museums the ones with the lowest one. Although the percentage of art museums with educational resource is once again of a quarter, the one of history museums drops significantly to more than a third. Anthropology and archaeology museums, on the other hand, have in-situ downloadable activities in a third of each sample of those with any educational resource. If the virtual activities are the analysed ones, again a third of anthropology museums with educational resources implement them, but only slightly more than a tenth of both history and art museums. Archaeology museums, however, do not implement this feature in any case. Edutainment activities, finally, also have anthropology museums as the ones that most extensively present them on the websites with one out of three institutions of those with educational resources doing it. Similarly, a fourth and nearly seventeen per cent of history and archaeology museums of those with any educational resource respectively deliver this kind of activities to the virtual users. Among art museums, however, less than a tenth of the sample with educational resources have some kind of edutainment activity. Consequently, it is evident that there are diverse models of delivery and communication of educational resources attending to the different types of institution analysed.

Table 72
Type of educational resources percentage per type of institution

	Art museums %	History museums %	Anthrop. museums %	Archaeo. museum %	Cultural sites %	Other %
Schedule, contact inf.	97.8 (78.5)	87.5 (46.7)	100.0 (75.0)	83.3 (83.3)	0.0 (0.0)	87.5 (70.0)
Publications	26.1 (20.9)	75.0 (40.0)	66.7 (50.0)	66.7 (66.7)	0.0 (0.0)	43.8 (35.0)
In-situ activities	25.4 (20.3)	37.5 (20.0)	33.3 (25.0)	33.3 (33.3)	0.0 (0.0)	25.0 (20.0)
Virtual activities	13.8 (11.0)	12.5 (6.7)	33.3 (25.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Edutainment activities	6.5 (5.2)	25.0 (13.3)	33.3 (25.0)	16.7 (16.7)	0.0 (0.0)	12.5 (10.0)
Other	1.4 (1.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

Note: Values in parentheses refer to the percentage of the total of the sample

Looking at the combination of different educational resources, there is a global opposite pattern between anthropology and history museums. In fact, among the first ones the combination of schedule and contact information and publications is the most present one with a percentage of two thirds, while among history museums it is the less present one with nearly six sevenths. In both cases, the rest of the cases have equal values, namely a total presence in history museums with educational resources and a presence in a third of anthropology ones. Analysing archaeology and art museums, in both cases the combination of schedule and contact information and publications is the most present one with a presence in half and in a quarter of the cases respectively. If the schedule and contact information is combined with in-situ activities, this combination is the second most pre-eminent in a third of the sample of archaeology museums and in about a fourth of art museums. Also a third of the archaeology museums combine publications with in-situ activities and nearly seventeen per cent of the sample combine edutainment activities with schedule and contact information, publications or in-situ activities. Regarding art museums, only the combination of schedule and contact information and virtual activities and the one of publications and in-situ activities have a presence over a tenth. Anyway, art museums present all possible combinations of the diverse features.

Table 73
Contingency table of the type of educational resources in percentage of the total by type of institution

		Schedule and contact	Publications	In-situ activities	Virtual activities	Edutainment activities
Anthrop. museums	**Schedule and contact**	---	66.7	33.3	33.3	33.3
	Publications	66.7	---	33.3	33.3	33.3
	In-situ activities	33.3	33.3	---	33.3	33.3
	Virtual activities	33.3	33.3	33.3	---	33.3
	Edutainment activities	33.3	33.3	33.3	33.3	---
Archaeo. museums	**Schedule and contact**	---	50.0	33.3	0.0	16.7
	Publications	50.0	---	33.3	0.0	16.7
	In-situ activities	33.3	33.3	---	0.0	16.7
	Virtual activities	0.0	0.0	0.0	---	0.0
	Edutainment activities	16.7	16.7	16.7	0.0	---
Art museums	**Schedule and contact**	---	25.4	24.6	13.8	6.5
	Publications	25.4	---	13.8	5.1	3.6
	In-situ activities	24.6	13.8	---	8.0	3.6
	Virtual activities	13.8	5.1	8.0	---	3.6
	Edutainment activities	6.5	3.6	3.6	3.6	---
History museums	**Schedule and contact**	---	83.3	100.0	100.0	100.0
	Publications	83.3	---	100.0	100.0	100.0
	In-situ activities	100.0	100.0	---	100.0	100.0
	Virtual activities	100.0	100.0	100.0	---	100.0
	Edutainment activities	100.0	100.0	100.0	100.0	---

As happens with the cases by country, in order to delimit and identify different profiles of implementation of the features, the research is going to analyse diverse association rules among features by type of institution[63]. As done during the previous analyses, the different searching options, the four main types of presentation of the collection and educational resources have been treated as consequents of the rules. The initial minimum threshold

[63] Only strong linear relations will be mentioned on the analysis.

requirements to be met by the rule in order to be considered valid are a support of the antecedent of 15.0 per cent and of confidence of the rule itself of 95.0 per cent[64].

Analysing the association rules related to the different types of institution, the first finding is that, while the rest of the institutions present rules for the combination of different searching tools, anthropology museums have a rule concerning the implementation of a complex one. This basic rule states that all anthropology museums with databases, collection presentation, labels and explaining texts have a complex searching tool on their website. These antecedents are present in combination in three fourths of the sample. If author details and schedule and contact information are added, but no other type of educational resources, the support of the antecedents drops to half of the sample, but the confidence remains total. Among the rest of institutions, history museums are the ones with rules with the highest support value. There are three basic rules with 40.0 per cent of support of the antecedents, but in all of them the presence of catalogues is the common feature. In fact, the combination of catalogues and databases, of catalogues and labels and of catalogues, collection and images always have a combination of searching tools as a consequence in the sample of history museums. The further inclusion of any other feature within these combinations makes only the support of the antecedents drop below two fifths of the sample, but the confidence is still of a 100.0 per cent. Regarding archaeology museums, there is only one rule with more than a single case. Actually, this rule, whose antecedents represent a support value of 33.3 per cent, affirms that all archaeology museums with databases, collection, images, labels and educational resources, but no virtual, edutainment or other type of educational activities present a combination of searching tools on the web space of the institution. Finally, among art museums, there is no rule that meets the minimum requirement of presence and, consequently, it has been lowered below 10.0 per cent. The two most present identified rules share a support of the antecedents of 6.4 per cent and a total confidence, but the antecedents differ slightly. The first rule has catalogues, highlights, collection presentation, explaining texts, author details and links to related works as antecedents for a combination of searching tools, while in the second case the antecedents consist of catalogues, collection presentation, databases, image zoom and links to related works.

[64] In some cases, these requirements have been lowered in order to find some rules. In this case, the change of the minimum threshold will be explicitly stated. In some other cases, due to the absence of rules or to the great importance of them, some rules will not fulfil these thresholds, but will also be explicitly stated.

Table 74
Summary of the main basic rules regarding the searching options by type of institution

Type of institution	Consequent	Antecedents	% of support	% of confidence	% of support of the rule
Anthropology museums	Searching tool - Complex	Databases Collection Label Explaining texts	75.0	100.0	75.0
History museums	Searching tool - Combined	Catalogues Databases	40.0	100.0	40.0
History museums	Searching tool - Combined	Catalogues Label	40.0	100.0	40.0
History museums	Searching tool - Combined	Catalogues Collection Images	40.0	100.0	40.0
Archaeology museums	Searching tool - Combined	Databases Collection Images Label Educational resources Schedule and contact No virtual activities No edutainment activities No other educational activities	33.3	100.0	33.3
Art museums*	Searching tool - Combined	Catalogues Highlights Collection Explaining texts Author details Links to related works	6.4	100.0	6.4
Art museums*	Searching tool - Combined	Catalogues Collection Databases Image zoom Links to related works	6.4	100.0	6.4

Note: * Support requirement lowered to 5.0%

Regarding the diverse association rules for catalogues on different types of institutions, history museums present a really strong relation between this feature and the combination of different searching tools. 46.7 per cent of the websites of the sample of history museums have a combination of different searching tools, as well as digital catalogues of their holdings. The confidence degree of this association is total. When including databases on the previous antecedent, only the support value drops to 40.0 per cent, remaining the confidence total. The same values are achieved by the antecedents of a combination of searching tools, collection presentation and either images or labels. If a combination of searching tools, databases, collection and images or labels is analysed as antecedent, all of the cases have catalogues on their websites. The support of both the antecedents and the rule is of 33.3 per cent. Finally, regarding history museums, there is another rule with total

confidence that takes place in a third of the sample. It affirms that history museums with a combination of searching tools and educational resources have catalogues on their websites. Archaeology museums, on the other hand, present a single rule of association with catalogues as a consequence. It states that a third of archaeology museums are British institutions with databases, highlights, collection, images, labels, explaining texts and educational resources on their websites and all of them deliver, as well, a digital catalogue of the contents of the institution. Art museums present two different basic rules with total confidence and both of them have a support of the antecedents of 16.3 per cent. The antecedents of the first one are a combination of databases, images, labels, explaining texts, author details and educational resources, while the second one presents a combination of databases, highlights, images, labels and explaining texts. In the case of this last one, author details can also be added to the antecedents, but then their support drops to 15.7 per cent. Finally, there are no rules regarding the use of catalogues on anthropology museums, because all the percentages refer to a single case.

Table 75
Summary of the main basic rules regarding the presentation of catalogues by type of institution

Type of institution	Consequent	Antecedents	% of support	% of confidence	% of support of the rule
History museums	Catalogues	Searching tool - Combined Databases	40.0	100.0	40.0
History museums	Catalogues	Searching tool - Combined Collection Images	40.0	100.0	40.0
Archaeology museums	Catalogues	United Kingdom Databases Highlights Collection Image Label Explaining texts Educational resources	33.3	100.0	33.3
History museums	Catalogues	Searching tool – Combined Databases Collection Images	33.3	100.0	33.3
History museums	Catalogues	Searching tool – Combined Educational resources	33.3	100.0	33.3
Art museums	Catalogues	Databases Images Label Explaining text Author details Educational resources	16.3	100.0	16.3
Art museums	Catalogues	Databases Highlights Images Label Explaining text	16.3	100.0	16.3

Taking a close look at the association rules by different types of institution with databases as a consequent, anthropology museums are the ones with the highest support values. In fact, all the cases from the sample are British institutions with collection presentation by labels and all of them have also databases on the website. The inclusion of a complex searching tool and explaining texts or of educational resources keeps a 100.0 per cent of confidence of the rule, but the support of the antecedents drops to 75.0 per cent. Among archaeology museums, there are three features that as antecedents have 100.0 per cent of confidence in order to present a digital database on the website. Anyway, their support varies, because while collections are present in half of the sample, the combination of searching tools or catalogues has a presence of a third. If these features are presented in British archaeology museums together with images, labels and educational resources, both support and confidence degrees remain the same. History museums have a basic rule of association to present databases as a consequent. Actually, 26.7 per cent of the sample are

American museums with a combination of searching tools and catalogues and all of them have databases as well on their websites. The further addition of other features to this rule drops only the support percentage of the antecedents, but not the confidence one. The same pattern is identified among art museums, with the difference that the support percentage of the basic rule is of 19.2 per cent and that the antecedents are quite different. In fact, among art museums, institutions with a combination of searching tools, labels and author details are the ones with databases always as a consequent. Also in this case, the inclusion of other features in the antecedents decreases their support, remaining the confidence total.

Table 76
Summary of the main basic rules regarding the presentation of databases by type of institution

Type of institution	Consequent	Antecedents	% of support	% of confidence	% of support of the rule
Anthropology museums	Databases	United Kingdom Collection Labels	100.0	100.0	100.0
Anthropology museums	Databases	United Kingdom Collection Labels Searching tool - Complex	75.0	100.0	75.0
Anthropology museums	Databases	United Kingdom Collection Labels Explaining texts	75.0	100.0	75.0
Anthropology museums	Databases	United Kingdom Collection Labels Educational resources	75.0	100.0	75.0
Archaeology museums	Databases	Collection	50.0	100.0	50.0
Archaeology museums	Databases	United Kingdom Collection Images Labels Educational resources	50.0	100.0	50.0
Archaeology museums	Databases	Searching tool - Combined	33.3	100.0	33.3
Archaeology museums	Databases	Catalogues	33.3	100.0	33.3
History museums	Databases	USA Searching tool - Combined Catalogues	26.7	100.0	26.7
Art museums	Databases	Searching tool – Combined Labels Author details	19.2	100.0	19.2

Looking at highlights as a consequent, only archaeology and art museums present association rules, because there are no anthropology museums with highlights and the values of the history ones refer to a single case. Explaining texts in archaeology museums have a support of 66.7 per cent and a confidence to have highlights as a consequent of 100.0 per cent. If explaining texts are presented with images and educational resources, there is no variation on the values of support or confidence. Another rule concerning archaeology museums states that half of them are British institutions with images, labels, explaining texts and educational resources and that in every case there is a presentation of highlights of the contents of the museum. In order to find any valid rule among art museums, the minimum support requirement has been lowered to 10.0 per cent. The most present rule has a support of the antecedents of 11.6 per cent and a total confidence to have highlights as a consequence. The antecedents of this rule are a combination of searching tools, catalogues, images, labels, explaining texts and image zoom options. If images and labels of the antecedents are replaced by databases, the support scores 11.0 per cent, but the confidence still remains total. Other different combinations of features score lower values of support or confidence of the rule.

Table 77
Summary of the main basic rules regarding the presentation of highlights by type of institution

Type of institution	Consequent	Antecedents	% of support	% of confidence	% of support of the rule
Archaeology museums	Highlights	Explaining texts	66.7	100.0	66.7
Archaeology museums	Highlights	Images Explaining texts Educational resources	66.7	100.0	66.7
Archaeology museums	Highlights	United Kingdom Images Labels Explaining texts Educational resources	50.0	100.0	50.0
Art museums*	Highlights	Searching tool – Combined Catalogues Images Labels Explaining texts Image zoom	11.6	100.0	11.6
Art museums*	Highlights	Searching tool – Combined Catalogues Databases Explaining texts Image zoom	11.0	100.0	11.0

Note: * Support requirement lowered to 10.0%

Regarding the rules of collection as consequents by type of institution, anthropology museums present exactly the same rules as in the cases with databases as a consequent. The only difference resides on the fact that databases and collections exchange their places in the antecedents and consequent features. Therefore, all British anthropology museums have databases and labels and all of them present a great part or the whole collection. As happens with the rules regarding databases as a consequent, the support of a complex searching tool and explaining texts or of educational resources drops to 75.0 per cent. The confidence of the rule, however, remains the same. Among archaeology museums also the same repetition phenomenon takes place, due to the total correlation between databases and the presentation of a great part of the collection. Consequently, also in this case databases, the combination of searching tool and catalogues alone have a confidence of 100.0 per cent in order to explain collection as a consequent on archaeology museums. The support of these features, however, varies from half of the sample in the case of the first one to a third in the case of the two latter ones. As with databases as a consequent, the inclusion of these features in British museums with images, labels and educational resources maintains the same values of support and confidence. Regarding history museums, there are two basic association rules in this category. The first one has a support of 40.0 per cent and states that history museums with a combination of searching tools, digital catalogues and images present in all the cases a great part or the whole collection of the institution. On the other hand, the second basic rule affirms that history museums with a combination of searching tools, catalogues, databases and either images or labels separately present their collection in all the cases. These antecedents have a support of a third of the sample and the confidence of the rule is total. If images and labels are added together, the confidence remains the same, but the support decreases to 26.7 per cent. Finally, art museums are the only ones in which the confidence threshold has to be lowered below 95.0 per cent in order to find any valid rule. In fact, there is one basic rule with a combination of searching tools and labels as antecedents. The support of these antecedents is of 29.7 and the confidence of 94.1 per cent, reaching the confidence of the rule 27.9 per cent. If images or catalogues are added separately, in both cases the support decreases. With the inclusion of images, both support and confidence drop to 27.3 and 96.3 per cent respectively, giving as a consequence a support of the rule of 25.6 per cent. Including catalogues within the antecedents of the basic rule, however, makes the support drop to 22.1 per cent, but increases the confidence to 94.7 per cent. The support of this rule is consequently of 20.9 per cent. If images and catalogues are added jointly, the antecedents

have a support of 19.8, a confidence of 94.1 and the rule as a whole a support of 18.6 per cent. Exactly the same values are achieved if, instead of images, databases are the included feature in this last combination.

Table 78
Summary of the main basic rules regarding the presentation of collection by type of institution

Type of institution	Consequent	Antecedents	% of support	% of confidence	% of support of the rule
Anthropology museums	Collection	United Kingdom Databases Label	100.0	100.0	100.0
Anthropology museums	Collection	United Kingdom Databases Label Searching tool – Complex	75.0	100.0	75.0
Anthropology museums	Collection	United Kingdom Databases Label Explaining texts	75.0	100.0	75.0
Anthropology museums	Collection	United Kingdom Databases Label Educational resources	75.0	100.0	75.0
Archaeology museums	Collection	Databases	50.0	100.0	60.0
Archaeology museums	Collection	United Kingdom Databases Images Labels Educational resources	50.0	100.0	50.0
History museums	Collection	Searching tool – Combined Catalogues Images	40.0	100.0	40.0
Archaeology museums	Collection	Searching tool - Combined	33.3	100.0	33.3
Archaeology museums	Collection	Catalogues	33.3	100.0	33.3
History museums	Collection	Searching tool – Combined Catalogues Databases Images	33.3	100.0	33.3
History museums	Collection	Searching tool – Combined Catalogues Databases Labels	33.3	100.0	33.3
Art museums*	Collection	Searching tool – Combined Labels	29.7	94.1	27.9

Note: * Confidence requirement lowered to 90.0%

The last area of analysis for the association rules takes the presence of educational resources as a consequent. In this case, archaeology museums present the highest values of support of the antecedents. Actually, images have a support of 83.3 per cent among archaeology museums and a confidence of 100.0 per cent to be accompanied by educational resources on the website. If images are combined with British institutions, with highlights and explaining texts or with labels, the support of the antecedents decreases to 66.7 per cent, but the confidence of the rule remains total. The combination of all these features together achieves a support of 50.0 per cent and a confidence of 100.0 per cent of the rule. The same values are scored by British archaeology museums with databases, collection, images and labels. This last combination is also present among anthropology museums, presenting also exactly the same values as the archaeology ones. Looking at anthropology museums, there is another rule with 50.0 per cent of support and 100.0 per cent of confidence. It states that British anthropology museums with a complex searching tool, databases, collection, labels, explaining texts and author details always present any educational resource on their website.

Among the types of institutions with rules with total confidence, only history museums do not meet the minimum support requirement. If this threshold is lowered, however, two different rules can be identified with a support of 13.3 per cent. On the one hand, British history museums with catalogues, images and explaining texts always deliver some educational resources on their websites. The same fact is applicable to history museums with an advanced searching tool, catalogues, databases, collection presentation, images, labels, author details and image zoom options. Finally, although they fulfil all the minimum requirements, art museums are the ones whose rules do not have a total confidence. The rule with the highest value in this sense affirms that American institutions with simple searching tools, images and labels have educational resources in 96.1 per cent of the cases. Taking into consideration that the support of the antecedents is of 15.1 per cent, the support of the rule is 14.5 per cent. The other rule has a slightly lower degree of confidence, but as the support of the antecedents is significantly higher, also is its support of the rule. In fact, 96.0 per cent of American art museums with labels and author details have educational resources and, taking into account that the support of the antecedents is of 29.1 per cent, the support of this rule scores 27.9 per cent. If images are included in this combination, support of the antecedents, confidence of the rule and support of the rule decrease slightly, achieving 28.5, 95.9 and 27.3 per cent respectively.

Table 79
Summary of the main basic rules regarding the presentation of educational resources by type of institution

Type of institution	Consequent	Antecedents	% of support	% of confidence	% of support of the rule
Archaeology museums	Educational resources	Images	83.3	100.0	83.3
Archaeology museums	Educational resources	United Kingdom Images	66.7	100.0	66.7
Archaeology museums	Educational resources	Highlights Images Explaining texts	66.7	100.0	66.7
Archaeology museums	Educational resources	Images Labels	66.7	100.0	66.7
Anthropology museums	Educational resources	United Kingdom Databases Collection Images Labels	50.0	100.0	50.0
Anthropology museums	Educational resources	United Kingdom Searching tool – Complex Databases Collection Labels Explaining texts Author details	50.0	100.0	50.0
History museums*	Educational resources	United Kingdom Catalogues Images Explaining texts	13.3	100.0	13.3
History museums*	Educational resources	Searching tool - Advanced Catalogues Databases Collection Images Labels Author details Image zoom	13.3	100.0	13.3
Art museums	Educational resources	USA Searching tool – Simple Images Labels	15.1	96.1	14.5
Art museums	Educational resources	USA Labels Author details	29.1	96.0	27.9

Note: * Support requirement lowered to 10.0%

4.1.10.- Grouping of institutional websites

After having analysed the different patterns of web technologies implementation by country of origin and type of institution, the research aims at identifying potential archetypical groups among institutions. This process of group identification has been approached from different but interrelated perspectives. On the first place, an initial

exploratory approach has been carried out using a hierarchical clustering analysis. This part of the research is expressed by a dendrogram that visualizes the different groups. Secondly, after delimiting the number of groups to be identified, the research has carried out a more in-depth cluster analysis based on the K-means of diverse variables. Finally, an additional factorial analysis has been performed, not to group institutions by cases, but to group different variables to create factors that guide the clustering process.

4.1.10.1.- Hierarchical clustering

First of all, the initial exploratory approach to the classification of the cases has been done using a hierarchical cluster analysis. As the research aims at identifying potential clusters related to the philosophy of communication of the institutional websites, the variables used for this purpose have been the ones dealing with the different aspects of this issue. Consequently, the very first approach has utilized the variables regarding the type of digital resources, the searching options, the presentation of the collection, the presentation of the contents and the educational resources. Based on the between-groups linkage clustering method, whose interval is measured by the squared Euclidean distance, the initial results have shown that there is an outlier case among the analysed ones that distorts the hierarchical clustering process. Once identified the case, the research has determined that the reason of the distortion is the lack of content presenting features on the institutional website. Having recognized this phenomenon, the outlier case has been disregarded for any further clustering analysis. Therefore, the sample for the clustering process and the factorial analysis has been reduced to 218 entries. The hierarchical clustering process has been performed again with the new sample in order to achieve a clearer overview of the groups to proceed to a more exhaustive analysis. Looking at the dendrogram delivered with the results, four main groups with significant entity can be identified at a remarkable level. Consequently, these results will be taken into account for further clustering and, thus, the number of clusters for the K-means analysis has been delimited to four.

Figure 11: Miniature of the dendrogram obtained from the hierarchical clustering process of 218 entries.

4.1.10.2.- K-means clustering

After having performed the hierarchical analysis, the research, also supported by theoretical models of the literature[65], has limited the maximum number of clusters to four for the subsequent K-means analysis. As for the previous analysis, the same variables have been selected for the current one. In fact, this selection has been made in order to find potential distinct groups answering to differences on the philosophy of web communication. Consequently, the variables used for the analysis of type of digital resources, searching degree, presentation of the digital collection, presentation of digital contents and

[65] See section "2.4.4.- The changing paradigm of communication" for a broader explanation of the models.

educational resources will be used for the identification and delimitation of groups using the K-means process. At an initial stage, all the variables from these sections have been included on the analysis, but a first performance of the statistic process identifies that the variables related to reconstructions and immersive environments of the presentation of the digital collection are not suitable for this analysis. Thus, these two variables have been removed from any further clustering process.

In order to obtain the results of the analysis, some concrete technical specifications have been delimited. As mentioned above, the maximum number of clusters has been set to four. The maximum number of iterations, conversely, has been limited to ten. Before the iteration process, the minimum distance between initial centres was 5.292. After this process, however, the distance between the final cluster centres are as follows.

Table 80
Distances between final cluster centres

Cluster	**1**	**2**	**3**	**4**
1		4.798	3.795	6.008
2	4.798		5.866	3.508
3	3.795	5.866		4.595
4	6.008	3.508	4.595	

The weight of each variable in the clustering differs from one to other, as the ANOVA analysis of the process shows. In fact, the significance values of some variables are clearly above the estimated limit for their optimum significance, which has been limited to .05. Among the variables that do not meet this requirement, the explaining texts are the ones with the highest value (.724), followed by contextualization (.281), links to news (.272), other content presentation (.135), highlights of the collection (.122) and virtual museums (.119). Among the variables that fulfil the significance requirement, the one dealing with digital exhibitions presents the highest value (.048), followed by the ones dealing with images (.026), links to related works (.005) and labels (.001). The rest of the variables share a significance value of .000.

Table 81
ANOVA

		F	Sig.
Variables	Type of digital resources	2,678.200	.000
	Searching tool - Degree	644.199	.000
	Digital collection - Catalogues	16.042	.000
	Digital collection - Databases	114.036	.000
	Digital collection - Highlights	1.885	.133
	Digital collection - Collection	28.284	.000
	Digital collection - Exhibitions	2.684	.048
	Digital collection - Virtual museum	1.973	.119
	Digital collection - Other	6.296	.000
	Presentation of digital contents - Image	3.142	.026
	Presentation of digital contents - Label	6.014	.001
	Presentation of digital contents - Explaining text	.441	.724
	Presentation of digital contents - Author details	9.166	.000
	Presentation of digital contents - Contextualization	1.283	.281
	Presentation of digital contents - Image zoom	8.278	.000
	Presentation of digital contents - Link related works	4.385	.005
	Presentation of digital contents - Link news	1.311	.272
	Presentation of digital contents - Other	1.875	.135
	Educational resources - Schedule and contact	508.936	.000
	Educational resources - Publications	209.905	.000
	Educational resources - In-situ activities	250.808	.000
	Educational resources - Virtual activities	515.573	.000
	Educational resources - Edutainment activities	735.567	.000
	Educational resources - Other	5,342.738	.000

According to these clustering criteria, there is a variable number of cases in each one of the groups. The most numerous one is the cluster labelled as two, which comprises 101 cases of the total. Cluster number four, on the other hand, consists of 69 cases, while number one and three are made of 32 and 16 cases respectively. Consequently, the 218 entries of the sample for the clustering analysis are not homogeneously distributed along the different clusters, but answering to the previously explained criteria. Actually, 46.3 per cent institutional websites are placed in the second cluster and three out of ten in the fourth one. Cases in the cluster number one account for 16.7 per cent of the total sample used for the clustering process. Finally, the cluster number three is the one with the lowest presence, because only slightly more than seven per cent of the cases are identified with this cluster.

Table 82
Number of cases in each cluster and percentage

		N	%
Cluster	1	32	16.7
	2	101	46.3
	3	16	7.3
	4	69	31.7
	Total	218	100.0

Once the cases have been placed into the corresponding cluster, the research identifies the main features and characteristics of each group. Attending to the country of origin of the institutions, cluster one has a presence of British museums in three out of ten cases. Slightly lower is the presence of both Spanish and American institutions, while German ones represent more than a tenth of the sample of this cluster. No Greek institution is present in this cluster. Analysing the cluster labelled as two, the composition by country of origin differs significantly, because two thirds of the sample are American institutions, being the German and Spanish ones on the second place with slightly more than a tenth of presence in both cases. Leaving aside the absence of any Greek institution also in this cluster, British institutions represent the lowest value in this group, because they do not reach a presence of a tenth. Looking at cluster three, however, British institutions get the highest value again, with a presence over half of the sample. American museums, on the other hand, represent three tenths of the cluster, whereas German and Greek institutions represent slightly more than a six per cent of the sample in both cases. In this case, Spanish institutions are the ones with no presence in the cluster. Finally, cluster number four is the only one with representation from all the countries. American and British museums represent more and slightly less than two fifths of the group respectively. The cluster has a presence of Spanish institutions in more than a tenth of the total, whilst German and Greek museums represent more than a four and one per cent respectively.

Table 83
Country of origin in each cluster

	Cluster 1 **%**	**Cluster 2** **%**	**Cluster 3** **%**	**Cluster 4** **%**
Country of origin				
Germany	12.5	11.9	6.3	4.3
Greece	0.0	0.0	6.3	1.4
Spain	28.1	11.9	0.0	13.0
United Kingdom	31.3	9.9	56.3	39.1
USA	28.1	66.3	31.3	42.0

Conversely, analysing this relationship from the perspective of cluster affiliation by country of origin, obtained results differ. German institutions are included among the cases of cluster two in three fifths of the country sample. Another fifth is present in cluster one, while clusters four and three represent fifteen and five per cent of the German sample respectively. Greek institutions, on the other hand, are equally divided into cluster three and four, but it has to be taken into account that this sample consists only of two entries. Among the Spanish sample, two fifths are represented by institutions from cluster two,

while the other three fifths are distributed in equal percentage between clusters labelled as one and four. Institutions in cluster four represent nearly half of the British sample, but the remaining ones are split more or less homogeneously into the other three groups. Finally, the affiliation of American institutions is the most heterogeneous one, because cluster two and four represent three fifths and a quarter of the sample, whereas the remaining two clusters do not reach a presence of ten per cent.

Table 84
Affiliation to clusters by country of origin

	Germany %	**Greece** %	**Spain** %	**United Kingdom** %	**USA** %
Cluster 1	20.0	0.0	30.0	17.9	8.2
Cluster 2	60.0	0.0	40.0	17.9	60.9
Cluster 3	5.0	50.0	0.0	16.1	4.6
Cluster 4	15.0	50.0	30.0	48.2	26.4

Performing the analysis of the cluster composition by type of institution, in all the clusters art museums are the most present ones, due to their overwhelming amount compared to other types of institutions. In fact, in all the cases they represent more than two thirds of the sample. Moreover, only history museums in cluster one and three have a presence above a tenth of the sample. Even though its presence is below ten per cent, anthropology museums are only present in clusters three and four. A similar pattern is identified with archaeology museums, although the presence takes place in clusters two and four in this case. As far as for cultural sites, their presence is only observed in cluster one. Looking at institutions classified as others, they are present in all the clusters with percentages around ten per cent, except for the cluster 3, where the percentage decreases to six points.

Table 85
Type of institution in each cluster

	Cluster 1 %	**Cluster 2** %	**Cluster 3** %	**Cluster 4** %
Type of institution				
Art museums	68.8	85.1	75.0	75.4
History museums	15.6	3.0	12.5	7.2
Anthropology museums	0.0	0.0	6.3	4.3
Archaeology museums	0.0	2.0	0.0	4.3
Cultural sites	6.3	0.0	0.0	0.0
Others	9.4	9.9	6.3	8.7

Taking a look from the other perspective, art museums and institutions identified as other present a similar pattern of affiliation to clusters. In both cases, half of the sample is

represented in cluster two and three tenths in number four. Cluster one represents in both cases more than a tenth of the sample and the number three less than this percentage. Even though they are present in all clusters, history museums present a different distribution, because a third of the sample is represented both in cluster one, as well as four. Another fifth of the sample is represented by the cluster labelled as two, while the remaining thirteen per cent is comprised by institutions of cluster number three. The rest of the types of institutions are present in some specific clusters. Cultural sites, for example, are only represented in cluster one. Anthropology museums, on the other hand, are represented in cluster four and three in percentages of three fourths and a fourth respectively. Finally, cluster number four represents three fifths of archaeology museums, while the other two fifths are inscribed within cases of cluster three.

Table 86
Affiliation to clusters by type of institution

	Art museums %	**History museums %**	**Anthropology museums %**	**Archaeology museums %**	**Cultural sites %**	**Other %**
Cluster 1	12.8	33.3	0.0	0.0	100.0	15.0
Cluster 2	50.0	20.0	0.0	40.0	0.0	50.0
Cluster 3	7.0	13.3	25.0	0.0	0.0	5.0
Cluster 4	30.2	33.3	75.0	60.0	0.0	30.0

If the type of digital resources is analysed by cluster, there are two very specific groups among the clusters. Institutions in clusters number one and three only present their digital collections on the website in all the cases, while the ones in clusters two and four deliver both their digital collection, as well as educational resources electronically. As mentioned during the ANOVA analysis, this variable has a significance below .01 and its F value scores 2678.200. Consequently, the significance of this variable in the process of clustering cases is high.

Table 87
Type of resources in each cluster

	Cluster 1 %	**Cluster 2 %**	**Cluster 3 %**	**Cluster 4 %**	**F value**
Type of resources					2,678.200**
Digital collection	100.0	0.0	100.0	0.0	
Educational resources	0.0	0.0	0.0	0.0	
Both	0.0	100.0	0.0	100.0	

Note: * Significance ≤ .05 ** Significance ≤ .01

Similarly, also the degree of the searching options has been identified by the ANOVA analysis as a significant variable to cluster cases together. In fact, the significance of this variable is below .01 and its F value is 644.199. As happens with the type of digital resources, also in this case there are some clear differences. Actually, cluster one consists of institutions with no searching options in more than nine tenths of the sample. The remaining six per cent have a simple searching tool on the website. Cluster two has a similar pattern, but the presence of websites with simple searching tools increases significantly and comprises, additionally, a two per cent of cases with advanced searching tools. In fact, the percentage of websites with none searching tools decreases below two thirds, while the ones with simple searching tools represent a third of the total sample. In cluster three, three out of four cases present a combination of searching tools, while the remaining fourth is distributed equally between websites with advanced and with complex searching tools. Exactly the same pattern is reproduced in cluster four, but the presence of a combination of searching tools reaches nearly four fifths of the sample. The advanced and the complex searching tools, finally, represent in both cases a tenth of the sample.

Table 88
Searching options degree in each cluster

	Cluster 1 %	**Cluster 2 %**	**Cluster 3 %**	**Cluster 4 %**	**F value**
Searching options					644.199**
None	93.8	64.4	0.0	0.0	
Simple	6.3	33.7	0.0	0.0	
Advanced	0.0	2.0	12.5	10.1	
Complex	0.0	0.0	12.5	10.1	
Combined	0.0	0.0	75.0	79.7	

Note: * Significance ≤ .05 ** Significance ≤ .01

When dealing with the presentation of the collection, features have been introduced separately for the cluster analysis[66]. Taking a look at catalogues, among the four clusters two different groups can be identified. On the one hand, catalogues are present in slightly more than three tenths of cluster one and two. On the other, cluster three has catalogues in three fifths of the sample and cluster four in three fourths. The presence of catalogues has a significance below .01 and the F value of this variable is 16.042. Analysing the presence of databases, differences become more emphasized. In fact, this feature is present in only three per cent of the sample of the cluster one. This presence increases above ten per cent in cluster two, but is still far from the values of cluster three and four, which nearly score a

[66] Except for reconstruction and immersive environments due to their really low or null presence.

value of nine tenths. Once again, the ANOVA analysis gives a F value of 114.036 and a significance below .01 to this variable. The presence of highlights is one of the variables that does not fulfil the significance requirement to create clusters. In this case, its F value scores 1.885. Conversely to what happens with the previous features, highlights have a greater presence among cluster one and two than among three and four. In fact, cluster three is the one with the lowest presence, which does not reach half of the sample of the group. Cluster four and one are two percentage points below and above sixty per cent respectively, while cluster two is the one with the highest presence of highlights. In fact, seven out of ten museums in this cluster present a selection of their holdings done by the staff of the institution. Analysing the presence of great part of the collections, the pattern reverses again to the previous one. In other words, once again cluster one and two present the lowest percentages of collections presence, while three and four have values above nine tenths of the sample. Actually, more than a fourth of institutions in cluster one have a great part of their holdings on the website and four out of ten of the ones in cluster two, while more than nine out of ten do it in clusters three and four. The F value of this variable is 28.284 and the significance lies below .01. The presence of digital exhibitions, on the other hand, has a significance value below .05, with an F value of 2.685. The differences of presence between clusters are not so high this time, expect for cluster one, where none of the institutions implement this feature. The other three clusters present values between 16 and 21 per cent. Virtual museums are the other feature with no significance at the time of creating clusters. Their presence is above ten per cent only in the case of cluster four. In fact, cluster one and two have lower values and cluster three does not have any case with virtual museums. The F value of this feature is 1.973 and the significance ranks above the maximum threshold. Due to their low presence or absolute absence, digital reconstructions and immersive environments have not been included in the clustering process. Reconstructions are only present in one per cent of cluster two, while there are no immersive environments at all. Finally, other types of collection presentations are only present in cluster number one in less than a tenth of the cases. The analysis has given a F value of 6.296 and a significance below .01 to this last variable.

Table 89
Presentation of collection features in each cluster

	Cluster 1 %	Cluster 2 %	Cluster 3 %	Cluster 4 %	F value
Presentation of collection					
Catalogues	31.3	30.7	62.5	76.8	16.042**
Databases	3.1	12.9	87.5	89.9	114.036**
Highlights	62.5	70.3	43.8	58.0	1.885
Collection	28.1	42.6	93.8	91.3	28.284**
Exhibitions	0.0	16.8	18.8	21.7	2.684*
Virtual museums	6.3	5.9	0.0	14.5	1.973
Reconstructions	0.0	1.0	0.0	0.0	
Immersive environments	0.0	0.0	0.0	0.0	
Other	9.4	0.0	0.0	0.0	6.296**

Note: * Significance ≤ .05 ** Significance ≤ .01

Analysing the way institutions present their contents, images are the first feature to be observed in the present research. Images are present in most of the cases of all four clusters, but cluster three has the lowest percentage among all of them with slightly more than eight tenths. The other three clusters have images in more than nine tenths of the sample. The ANOVA analysis has identified that this feature has an F value of 3.142 and a significance below .05. These two values vary if the analysed feature is the presence of labels, scoring a value of 6.014 and a significance below .01. In this case, cluster one shows the lowest percentage with three fourths of the sample presenting labels. Conversely, all institutions of cluster three have labels of the content and nearly all of the ones in cluster four. Finally, nine out of ten of the institutions in cluster two deliver electronic labels. Looking at the explaining texts, this feature is the first one with no significance to cluster cases and its F value scores .441. Actually, the percentage of presence of this feature ranks from above four tenths in clusters ones and three to above half in clusters two and four. Author details, on the other hand, have a more heterogeneous pattern of implementation with only six per cent of presence in cluster one, but nearly six tenths in the fourth one. Cluster two and three present a percentage of delivery of author details in more than a third and two fifths of the sample, respectively. Once again, this feature has a significance below .01 and its F value is 9.166. When dealing with contextualization information, the feature is not considered significant to cluster institutions together in this research and the F value scores 1.283. This kind of information is present in both cluster one and two in less than a tenth of the samples. Cluster three and four, on the other hand, present higher values, but none of them reaches a fifth of the sample. Image zoom options are present in all the clusters with different degrees. The cluster with the lowest percentage of presence is the number one with a fifteen per cent, followed by cluster two with a fifth of presence of

image zoom options in the sample. The value doubles to reach two fifths when the analysed cluster is the number three and it exceeds half of the sample of cluster four. The results of the analysis have identified a significance value below .01 and an F value of 8.278. Links to related works is the last of the features with significance to cluster the cases. In fact, its values scores below .01 and the F value 4.385. Also in this case the presence of this feature in cluster one and two is below a tenth, while in cluster four it increases to seventeen per cent. The presence of links to related works in a fourth of cluster three represents the highest value among all of them. Finally, links to news are not present in any cluster in a percentage around ten per cent. This feature is not significant according to the analysis and the F value scores 1.311 in the case of this variable.

Table 90
Presentation of contents features in each cluster

	Cluster 1 %	Cluster 2 %	Cluster 3 %	Cluster 4 %	F value
Presentation of contents					
Images	96.9	98.0	81.3	92.8	3.142*
Labels	75.0	90.1	100.0	98.6	6.014**
Explaining texts	46.9	52.5	43.8	56.5	.441
Author details	6.3	37.6	43.8	58.0	9.166**
Contextualization	3.1	8.9	18.8	13.0	1.283
Image zoom	15.6	21.8	43.8	52.2	8.278**
Link related works	3.1	5.0	25.0	17.4	4.385**
Link news	0.0	1.0	6.3	4.3	1.311
Other	3.1	2.0	0.0	8.7	1.875

Note: * Significance ≤ .05 ** Significance ≤ .01

The last area of analysis is the one of the educational resources. According to the previous identification of type of resources delivered on the web, clusters one and three do not have any educational resource among their cases. Between cluster two and four, the latter one always presents higher values of presence of the features. Regarding the different features, all of them have been identified as significant by the analysis, because their significance is .000. Analysing schedule and contact information, cluster two has it in more than nine tenths of the sample and number four in all its entries. The F value of this variable is 508.936. Among the other features, the presence decreases significantly. In fact, publications are the most spread ones, representing a fourth of the sample of cluster two and nearly two fifths of the number four. This variable presents an F value of 209.905. Dealing with in-situ activities, the presence percentage decreases in both cases around five points, scoring a fifth in cluster two and more than a third in cluster four. The F value of the in-situ activities scores 250.808. The pattern remains the same also in virtual activities,

but percentages decrease to a tenth on cluster two and to sixteen in cluster four. The F value of this variable is 515.573. Finally, edutainment activities are the less present ones, with a presence of five per cent in cluster two and of nearly fifteen per cent in cluster four. The F value, however, increases to 735.567 in this case.

Table 91
Educational resources in each cluster

	Cluster 1 %	Cluster 2 %	Cluster 3 %	Cluster 4 %	F value
Educational resources					
Schedule and contact	0.0	94.1	0.0	100.0	508.936**
Publications	0.0	26.7	0.0	39.1	209.905**
In-situ activities	0.0	20.8	0.0	34.8	250.808**
Virtual activities	0.0	9.9	0.0	15.9	515.573**
Edutainment activities	0.0	5.0	0.0	14.5	735.567**
Other	0.0	1.0	0.0	1.4	5,342.738**

Note: * Significance ≤ .05 ** Significance ≤ .01

Once analysed the different frequencies among the clusters, there are some specific models that can be delimited according to the implementation of the diverse features.

- On the first place, cluster number one is identified by a model of an institution with merely digital collection, no searching tool, but highlights. The following feature to present the content in percentage is the presence of catalogues. Regarding the presentation of the content, images and labels have really high values, but the rest of features, except for the explaining texts, are the lowest ones.
- On the other hand, cluster two has both digital collection and educational resources, but with none or only simple searching tools. As in cluster one, collections are presented mostly by highlights, but there are also great parts of the collection and catalogues. Contents are presented by means of images, labels, explaining texts, author details and image zoom options. Among the educational resources, schedule and contact information is predominant, but publications and in-situ activities have also an important presence.
- Cluster three, conversely, presents only digital collection, but implementing advanced, complex or combined searching tools. In this case, the presentation of collection and databases are the predominant feature, but also catalogues have a high presence and in a lower degree highlights. Analysing the presentation of the content, still labels and images are the predominant ones, but also other features. Actually, contextualization and links to related works present the highest values of all.

- Finally, cluster four delivers both digital collection and educational resources by means of advanced, complex and combined searching tools. The four main features, namely collection, databases, catalogues and highlights are very present, but also exhibitions and virtual museums in a lower degree. All the features for the presentation of the contents have a high presence, with only contextualization, links to related works and link to news below half of the sample. Educational resources have a big importance, with all the cases presenting schedule and contact information and more than a third delivering publications and in-situ activities. Also virtual and edutainment activities are quite present in a lower degree.

Table 92
Summary of the cluster definition

	Cluster 1	**Cluster 2**	**Cluster 3**	**Cluster 4**
Type of digital resources	Digital collection	Digital collection Educational resources	Digital collection	Digital collection Educational resources
Searching tools	None	None Simple	Advanced Complex Combined	Advanced Complex Combined
Presentation of collection	Highlights Catalogues Collection	Highlights Catalogues Collection	Collection Databases Catalogues Highlights	Collection Databases Catalogues Highlights Exhibitions
Presentation of contents	Images Labels	Images Labels Explaining texts Author details Image zoom	Images Labels Explaining texts Author details Contextualization Link related work	Images Labels Explaining texts Author details Contextualization Link related work
Educational resources	No	Schedule and contact Publications In-situ activities	No	Schedule and contact Publications In-situ activities Virtual activities Edutainment activities
Identification of cluster	Didactic museum	Stimulating museum	Discovery museum	Constructivist museum

Consequently, according to this delimitation, there are four archetypical models of implementation of web technologies. Taking as a basis the theoretical model presented on section "*3.1.1.- Online access to digital collections on museums' websites*", the above mentioned clusters can be assimilated to the models proposed by the literature. Therefore, cluster number one can be labelled as the didactic museum, cluster number two as the stimulating museum, cluster three as the discovery museum and cluster number four as the constructivist museum. Thus, the present research has identified four archetypical models

of web philosophy of communication, which are backed by the models proposed by the literature for the philosophy of the physical institutions.

4.1.10.3.- Factorial analysis

Additionally, the research has carried out a factorial analysis in order to identify and delimit potential factors that influence the belonging of every case to one of the previously described four clusters. Taking into account all the variables measured, the most closely related to the explanation of the philosophy of communication adopted by the research have been used to identify potential factors. Therefore, type of institution, country of origin and digitized objects have not been included on the process[67]. Thus, the used variables have been the following ones:

- Type of digital resources: digital collection; educational resources; both.
- Searching tool degree: none; simple; advanced; complex; combined.
- Presentation of digital collection: catalogues; databases; highlights; collection; exhibitions; virtual museums; other.
- Presentation of digital contents: Image; label; explaining text; author details; contextualization; image zoom; link to related works; links to news; other.
- Educational resources: schedule and contact information; publications; in-situ activities; virtual activities; edutainment activities; other.

As happens with the K-means analysis, in order to delimit the results of the factor analysis, some technical specifications have been specified. After an initial exploratory approach to the factorial analysis, the scree plot suggests a limitation of the factor analysis to five main components. The maximum number of iterations, conversely, has been limited to 25. Similarly, results have been rotated using the Varimax rotation and the extraction has been done by means of the principal components analysis.

After having delimited the statistical specificities and before starting to proceed with any factorial analysis, the research has tested the adequacy of carrying out this process, by implementing a Kaiser-Meyer-Olkin (KMO) test and a Bartlett's test of sphericity. The KMO measurement analysis has given a result of the sampling adequacy a value of .847,

[67] As for the K-means clustering process, also reconstruction and immersive environments variables has been left aside, because the really low presence of these features on the analysed websites does not allow the analysis to be performed.

which remarks the adequacy of the sample to carry out a factorial analysis. Moreover, the Bartlett's test of sphericity has identified a significance value of .000, which denotes that the initial variables are not correlated and, consequently, that a factorial analysis of them is possible.

Table 93
KMO and Bartlett's Test.

Kaiser-Meyer-Olkin measure of sampling adequacy		.847
Bartlett's test of sphericity	Approx. Chi-Square	4003.894
	df	276
	Significance	.000

The next step of the factor analysis for this research has been the identification of the extracted value of communalities of each variable. The initial value of all the variables is one, but the extraction value resulting from the principal components analysis varies representing the per cent of variance explained by all the joint factors in one of the variables. Consequently, the higher the value, the higher can be considered the reliability of this specific variable. The variable dealing with the type of digital resources presented on the website is the one with the highest extracted value, which scores .976. The variables with the next highest values are all the ones related to the presence of different educational resources. Therefore, other type of educational resources, edutainment activities, virtual activities, schedule and contact information, in-situ activities and publications are the next variables in descending order on the list, with values ranking from .966 to .820. The presence of a great part of collection (.701) and of databases (.688) are the features dealing with the presentation of the collection that present the highest extracted communalities values. The degree of the searching tool of the website is the following variable in terms of communalities, with an extracted value of .687. On the contrary, the features with the lowest extracted values in ascending order are the presence of contextualization information (.232), of digital exhibitions (.321), of virtual museums (.324) and of catalogues (.376). The rest of the variables show extracted values above .400 for this analysis.

Table 94
Communalities

	Initial	**Extraction**
Type of digital resources	1.000	.976
Searching tool - Degree	1.000	.687
Digital collection - Catalogues	1.000	.376
Digital collection - Databases	1.000	.688
Digital collection - Highlights	1.000	.511
Digital collection - Collection	1.000	.701
Digital collection - Exhibitions	1.000	.321
Digital collection - Virtual museum	1.000	.324
Digital collection - Other	1.000	.506
Presentation of digital contents - Image	1.000	.612
Presentation of digital contents - Label	1.000	.452
Presentation of digital contents - Explaining text	1.000	.525
Presentation of digital contents - Author details	1.000	.413
Presentation of digital contents - Contextualization	1.000	.232
Presentation of digital contents - Image zoom	1.000	.439
Presentation of digital contents - Link related works	1.000	.537
Presentation of digital contents - Link news	1.000	.580
Presentation of digital contents - Other	1.000	.590
Educational resources - Schedule and contact	1.000	.882
Educational resources - Publications	1.000	.820
Educational resources - In-situ activities	1.000	.865
Educational resources - Virtual activities	1.000	.920
Educational resources - Edutainment activities	1.000	.945
Educational resources - Other	1.000	.966

Note: Extraction method – Principal Components Analysis

Similarly, also the principal components analysis has been used to obtain the variance explained by the diverse components. Following the specifications identified previously, the extraction and rotation of the initial values has been performed only with the five most important components. These five components explain at least five per cent of the initial variance individually. After the rotation of the factors, however, the percentage of the variance explained has changed, increasing the minimum value of these five components above six per cent of the total. After the rotation process of the initial eigenvalues, the sum of the five main components explains 61.945 per cent of the total variance of the sample for this research. In fact, the first component alone expresses a rotated eigenvalue of 6.401, which explains 26.669 per cent of the variance. The eigenvalue of the second component scores 2.972 and an explained per cent of the variance of 12.383. Values for the third component decrease to 2.422 and 10.092 and for the fourth one to 1.605 and 6.685 respectively. Finally, the fifth component is the less powerful one among the analysed ones when explaining the variance of the sample, with a rotated eigenvalue of 1.468 and a percentage of the total variance of 6.115. As mentioned before, the sum of these five

components explains more than three fifths of the variance of the sample analysed in this research.

Table 95
Total variance explained

Comp.	Initial eigenvalues			Extraction sums squared loadings			Rotation sums squared loadings		
	Total	**% variance**	**Cumulative %**	**Total**	**% variance**	**Cumulative %**	**Total**	**% variance**	**Cumulative %**
1	6.579	27.413	27.413	6.579	27.413	27.413	6.401	26.669	26.669
2	3.529	14.703	42.117	3.529	14.703	42.117	2.972	12.383	39.052
3	2.055	8.562	50.678	2.055	8.562	50.678	2.422	10.092	49.144
4	1.484	6.185	56.864	1.484	6.185	56.864	1.605	6.685	55.829
5	1.219	5.081	61.945	1.219	5.081	61.945	1.468	6.115	61.945
6	1.162	4.841	66.786						
7	.991	4.130	70.916						
8	.937	3.903	74.819						
9	.839	3.497	78.316						
10	.743	3.094	81.410						
11	.735	3.064	84.474						
12	.678	2.827	87.301						
13	.572	2.384	89.685						
14	.516	2.150	91.835						
15	.480	2.000	93.836						
16	.429	1.788	95.623						
17	.291	1.214	96.837						
18	.222	.925	97.763						
19	.203	.846	98.609						
20	.130	.541	99.150						
21	.090	.373	99.523						
22	.057	.238	99.761						
23	.052	.216	99.977						
24	.006	.023	100.000						

Note: Extraction method – Principal Components Analysis

After a first approach to the values of the selected variables for the analysis, the factor analysis has performed a transformation of the components for a higher accuracy of the results. The transformation of the component has been done using concrete values for each one of them. The utilized values for each component are the following ones.

Table 96
Component transformation matrix

Component	1	2	3	4	5
1	.975	-.131	-.069	-.154	-.063
2	.191	.762	.542	.259	.147
3	.004	-.616	.740	.124	.240
4	.099	-.080	-.392	.587	.697
5	-.056	.127	.017	-.741	.657

Once the transformation values have been established, variables have been measured and placed within one of the above analysed five components. The values obtained by the variables denote the weight of each one in the factor[68]. In this sense, the most powerful variables are the one dealing with the different types of resources and the ones related to the different educational resources. All these variables are inserted in the first component, with values above .900 for all the cases, except for publications. The negative value of the variable regarding the type of resources presented is related to the inverse relation between the high and the low values with the other variables of the component. Among the five variables that the second component comprises, three of them have values above .800. In fact, the presentation of collections scores .829, the presence of databases .804 and the degree of the searching options .801. The delivery of highlights, conversely, presents a negative value of .533. The last variable in this second component is the implementation of catalogues, whose value is .502. The third component consists of links to news (.752), other type of presentation of the content (.694), links to related works (.628), digital exhibitions (.536), virtual museums (.486) and the presentation of contextualization information (.434). Among the variables of component four, again the communication of highlights has a presence, but its lower value in this case (.424) makes it more accurate to place this variable within the second component. The other type of digital collection is the variable with the highest value, because, although it is negative, it scores .667. The utilization of labels and explaining texts present values of .590 and .506 respectively in this component. This last variable, anyhow, takes place also in component five, but its value (.451) is lower than in the previous component. Actually, the presentation of images is the variable with the highest value in this last component, scoring .757. Finally, the image zoom option represents a value of .414 and the author details of .412 in this last component.

[68] Values below the threshold of .400 have been removed from the results.

Table 97
Rotated Component Matrix

	Component				
	1	**2**	**3**	**4**	**5**
Type of digital resources	-,979				
Educational resources - Other	,975				
Educational resources - Edutainment activities	,968				
Educational resources - Virtual activities	,957				
Educational resources - Schedule and contact	,932				
Educational resources - In-situ activities	,927				
Educational resources - Publications	,895				
Digital collection - Collection		,829			
Digital collection - Databases		,804			
Searching tool - Degree		,801			
Digital collection - Highlights		-,533		,424	
Digital collection - Catalogues		,502			
Presentation of digital contents - Link news			,752		
Presentation of digital contents - Other			,694		
Presentation of digital contents - Link related works			,628		
Digital collection - Exhibitions			,536		
Digital collection - Virtual museum			,486		
Presentation of digital contents - Contextualization			,434		
Digital collection - Other				-,667	
Presentation of digital contents - Label				,590	
Presentation of digital contents - Explaining text				,506	,451
Presentation of digital contents - Image					,757
Presentation of digital contents - Image zoom					,414
Presentation of digital contents - Author details					,412

Notes: Extraction Method - Principal Component Analysis. Rotation Method - Varimax with Kaiser Normalization. Rotation converged in 6 iterations.

Looking at these results, the performed factor analysis identifies the existence of five defined components. Analysing the variables present in each one of them, these components are identified by some specific features. Component one deals with the presence of educational resources on the website, while component two is related to the degree of the searching tools and the basic types of presenting the digital collection of the institution. The most complex features to present both the digital collections and the digital contents are present in component three. The fourth component, conversely, comprises the explaining features of presenting the contents, as well as other type of collection presentation, whilst, finally, component five embraces the visual features of the content, as well as the author related one. Consequently, these components can be labelled in order as educational resources, searching and basic collection presentation, advanced collection and content presentation, explaining content presentation and visual and author content presentation. Therefore, variables in this research can be clustered according to the logic of these five components.

4.1.11.- Validation of the premises

The current section of the research has dealt with the actual utilization of web technologies by museums. Due to the overwhelming amount of museums worldwide and to linguistic constraints, the sample of this research has been delimited to museums from Germany, Greece, Spain, the United Kingdom and the United States of America from the Virtual Library of Museums of the ICOM. Anyhow, only museums with their digital contents available on the Internet have been included into this analysis. Actually, about a tenth of the initial potential sample has been analysed in depth.

All the analyses of this part of the research have been performed to answer to the two first premises, namely premise *a': Different archetypical technological implementation models relate to different philosophies of communication* and premise *β': Different national cultural values and corporate values moderate the philosophy of communication of the institution*. Each of these general premises has respectively been specified into two precise and measurable working hypotheses.

Regarding the first premise, it deals with the most general use of web technologies to disseminate cultural contents by museums. Presuming the heterogeneity of the selected museums and, as literature states, that the philosophy of communication of every institution displays different web technologies features, the first null hypothesis states *"$H_0$1: There are no differences on the implementation of web technologies by museum*". This hypothesis assumes that all institutions should make the same use of the web technologies with no variation on the implementation of the different web features. In order to test this hypothesis, the research has performed a descriptive frequencies analysis, some initial cross tabulations and general association rules. According to the obtained results, there are variations on the implementation of web technologies by the analysed museums. First of all, four out of ten museums do not have any searching tool, while other three out of ten combine some of them. Related to the presentation of the collection, only highlights and digital collections are above half of the sample, catalogues and databases above forty per cent and, among the other features, only digital exhibitions have a presence in more than a tenth of the sample of this research. Concerning the presentation of the contents, nearly all museums present images and labels, more than half explaining texts, around a third author details and image zooming options and a tenth contextualization information and links to related works. Lastly, three fourths of this sample have any educational resource, with a clear predominance of schedule and contact information. Additionally, as the association

rules highlight, there are different combinations among all the previously explained features with fluctuations of support and confidence. All these evidences identify that there are different implementations of web technologies by museums. Consequently, the above mentioned null hypothesis has been rejected and it seems that there are evidences to state that *"Museums present differences on the implementation of web technologies to communicate their cultural digital contents"*.

In relation to the second part of this first premise, the null hypothesis of this research states *"$H_0$2: There are no different archetypical models of web implementation"*. After having identified that there are different degrees of web implementation by museums of the present sample, the research has performed a clustering process of the entries. All the features with significant presence have been included in the analysis. The grouping process has been performed by a hierarchical cluster, a K-means cluster and a factorial analysis. According to the results of the two first stages of the analysis, four different clusters have been identified. These four clusters, moreover, coincide with the theoretical models of the literature, namely, the didactic museum, the stimulating museum, the discovery museum and the constructivist museum. Additionally, the factorial analysis has identified five components that drive the clustering process of the sample of this research. These components are the educational resources, the degree of searching tools and basic presentation of the collection, the most complex features to present the collection and the contents, the explaining features and, lastly, the visual and author related features. Results show that the null hypothesis can be rejected and the research proposes that *"Museums present different archetypical models of web implementation to communicate their digital cultural contents"*.

These findings support that the premise *a': Different archetypical technological implementation models relate to different philosophies of communication* is suitable to analyse the web implementation by museums to communicate their digital cultural contents.

On the other hand, premise *β': Different national cultural values and corporate values moderate the philosophy of communication of the institution* deals with the differences on the implementation of web technologies by country of origin and type of institution analysed. The first null hypothesis of this premise states *"$H_0$3: Technological implementation of web applications does not differ by country of origin"*. To test this hypothesis, the research has performed a descriptive frequencies analysis and some association rules by country. According to the results

obtained, there are some differences related to the country of origin of the institution. Regarding the searching tools, museums from Germany and Spain do not have any searching tool in more than half of the sample, while institutions from the United Kingdom have about half of the institutions with a combination of searching tools. Looking at the presentation of the collection, Germany has mostly catalogues and highlights, Spain digital collections, the United Kingdom catalogues, databases, highlights and digital collections and the United States highlights and digital collections. Even though the presentation of contents presents more similar patterns, the degree of presence of educational resources vary from more than four fifths among American museums to two thirds among the British ones. The association rules also remark these patterns. Therefore, American institutions are more educational-oriented and the British ones more research-oriented. Thus, there are evidences to reject the null hypothesis and to support that *"Country of origin of the institution moderates the web technological application model of museums to communicate their digital cultural contents"*.

Finally, the last null hypothesis of this part of the research has dealt with the differences on the implementation of web technologies by type of institution and states *"$H_0$4: Technological implementation of web applications does not differ by type of institution"*. The same processes as on the previous case have been executed to test the validity of this null hypothesis, but performing the operations by type of institution. According to the results, art museums do not have any searching tool in more than two fifths of this sample, history museums in two fifths and archaeology ones in one third. More than two fifths of history museums and a third of the archaeology ones have a combination of tools, while three fourths of anthropology museums have a complex one. Regarding the presentation of the collection, anthropology museums do not present highlights in any case of this sample, but always databases and digital collections, while the rest of institutions present a variable degree. Analysing the presentation of the content, anthropology museums present images in half of the sample, while the rest of institutions have them in almost all cases. Labels, similarly, have a presence in most of the cases and in all the anthropology museums. Taking a closer look at the educational resources, history museums have them in nearly half of this sample, but the rest of institutions with a significant presence have them in most of the cases. The association rules also reaffirm that anthropology museums have features more related to research than other museums. Therefore, also in this case, the null hypothesis has been

rejected. Consequently, the research proposes that *"Type of institution moderates the web technological application model of museums to communicate their digital cultural contents".*

These findings support that the premise *β': Different national cultural values and corporate values moderate the philosophy of communication of the institution* is suitable to analyse the web implementation by museums to communicate their digital cultural contents.

Summing up, the current section of the analysis has tested the two first premises of the research. Once rejected the initially proposed null hypotheses, the research has proposed four alternative ones. These four alternative assumptions reaffirm the statements of premises α' and β'. Thus, this research suggests that different archetypical technological implementation models relate to different philosophies of communication and that different cultural values and corporate values moderate the philosophy of communication of the institutions.

4.2.- Users' weblogs analysis

The second main results section of this research approaches the topic from the perspective of the use by final virtual visitors of the digital resources made available by museums on their websites. This section reports the results of the analyses performed using the weblogs information provided by the Benaki Museum of Athens (Greece), the Diocesan and Regional Museum of Lleida (Spain) and the Pitt Rivers Museum of the University of Oxford (United Kingdom). The information about the use of these websites will be the used one to answer the last premise of the research. Namely,

- Premise γ': Users' behavioural pattern differs on websites of museums with different character and philosophies and their diverse features.

As mentioned on the design of the empirical framework of the research, this section reports on the results that answer the above mentioned premise from both the global and the individual perspectives. The research performs different types of analysis. On the one hand, the global analysis' results display descriptive statistics and patterns identification for each institution and an additional comparison of the patterns of the three of them. After this global analysis, the second part of this section explains the results of the same analyses with the three different subsections of the Pitt Rivers Museum[69]. Finally, results focus on the individual behaviour of users within the database section of the Pitt Rivers Museum, due to availability of data. After some descriptive statistics, results report on different patterns of individual behaviour. Additionally, the last part of this section explains the real

[69] These subsections are the main site, the resources or projects present on the website and the databases of the objects and photographs, as will be explained on the corresponding section.

use of the databases by the visitors, explicitly describing and analysing the path of the visit of diverse individual users of this resource.

4.2.1.- Museums weblog analysis: general comparison of sites

This section reports on the patterns of global behaviour of visitors to the institutional websites of different cultural institutions. Due to data availability and to the different character of the institutions, the selected museums have been the Benaki in Athens (Greece), the Diocesan and Regional one of Lleida (Spain) and the Pitt Rivers one in Oxford (United Kingdom). Data referring to 2008 were provided by the staff in charge of each institution[70]. For the identification of potential different patterns, institutions are going to be first analysed separately and their individual patterns determined. Once the pattern of each one has been identified, the research will compare the three of them in order to highlight possible differences in terms not only of amount of users, but of patterns of number of visits and of general characteristics of these visits, among others.

4.2.1.1.- Benaki Museum

The first selected case is the one of the Benaki Museum. This institution, located in Athens (Greece), holds artefacts from various cultural environments, such as Ancient Greece, the Byzantine Empire or the Islam, among others. The Informatics Department is the responsible of the maintenance and management of the digital resources of the museum[71]. In general terms, during 2008, the website of the Benaki Museum has been the second institutional site of the sample with the highest amount of visitors, with a total of 450,749. Among all these visitors, 328,330 have been identified as unique IP addresses, which represent a percentage of 72.8 per cent of the total amount of virtual visitors and give a mean of 1.37 per IP. In terms of visited pages, however, the website of the Benaki Museum is the case with the highest amount, because during 2008 a total of 4,979,011 pages have been displayed. The number of hits, that is, of different elements shown in each displayed page is also the highest one during the analysed year with a total amount of 20,203,876. Consequently, the rate of hits per page during 2008 for the website of the Benaki Museum has been of 4.06[72]. Similarly, taking into account the total number of visitors and of unique

[70] In the case of the Diocesan and Regional Museum of Lleida, the information was provided by the Oliba research group of the Universitat Oberta de Catalunya (Barcelona).

[71] Logs with data referring to the virtual visitors are not stored and analysed by this Department, but by a third party. Consequently, not even the Museum staff has been able to access the primary source data.

[72] The month of June only presents five valid entries out of thirty. If the values of this month are not taken into account, the ratio of hits per page increases to 4.25.

IP addresses, the resulting mean of pages viewed by visitor is 11.04 and of pages viewed by IP of 15.16. Finally, the total amount of seconds spent on the website of the Benaki Museum has been 149,013,316 during 2008, which gives as a result an annual mean visit of 331 seconds per visitor, 454 seconds per IP and 30 seconds per page.

Table 98
Summary table of the data about the website of the Benaki Museum during 2008

Feature	**N**
Visitors	450,749
Unique IP addresses	328,330
Visitors per IP address	1.37
Total pages viewed	4,979,011
Total number of hits	20,203,876
Hits per page	4.06
Pages viewed per visitor	11.04
Pages viewed per IP address	15.16
Total seconds spent on the website	149,013,316
Annual average seconds per visitor	331
Annual average seconds per IP address	454
Annual average seconds per page	30

When analysing each of these features separately by month, the non-availability of the primary source of the data has represented an important handicap, because during the month of June, twenty five out of thirty entries do not have any value[73]. With the intention of regulating this problem, the research has replaced the values of June by the mean value of the sum of the amounts of May and July.

In order to identify and delimit the patterns of the website of the Benaki Museum, all the different measured features will be identified separately throughout the year 2008, as well as the relationship among them. In this sense, the first feature to be analysed is the one dealing with the amount of visitors to the site. As mentioned before, the total amount of virtual visitors to the website of the Benaki Museum has been 450,749. In order to avoid the distortion created by the missing values of June, this month has been replaced by the amount of 40,122 visitors[74] and this replacement gives as a result a total amount of 485,858 virtual visitors to the website of the Benaki Museum. Taking this new amount as a basis, the arithmetical mean of virtual visits per month during 2008 in the Benaki Museum website has been 40,488. The distribution of the visits, however, is not homogeneous,

[73] Not even the staff of the institution was able to identify the source of the problem, because the recollection and analysis of the data was outsourced to a third party.
[74] The identified primary amount of virtual visitors for June 2008 is 5,013.

because it presents a varying pattern depending on the analysed month. In fact, the months of March, April and May double the amount of visitors of August and nearly of July. In 2008, the website of the Benaki Museum has a visitor amount over the mean in January, March, April, May, October and November. Among these months, moreover, March, April and May exceed the 50,000 visitors. On the other hand, only June after the readjustment reaches 40,000 visitors. The remaining months do not score this amount and July and August not even 30,000 visitors. Analysing the year globally, four different types of month can be identified[75]: the ones with the most visitors, scoring over 50,000; the ones with an amount of more than 40,000 visitors; the ones around 35,000; and the ones with less than 30,000 visitors. In this classification, March, April and May are part of the first group; January, October and November represent the second one; the third group consists of February, September and December, whilst July and August are components of the group with the lowest amount of visitors.

Table 99
Visitors per month to the website of the Benaki Museum during 2008

Month	**N**
January	42,252
February	37,231
March	50,786
April	53,763
May	52,384
June	40,122*
July	27,860
August	25,279
September	35,070
October	42,478
November	44,195
December	34,438
Annual average	40,488**

Note: * The value with the missing values of June is 5,013 visitors.
** Average corrected.

Analysing the pattern regarding the unique IP addresses, the recollection identified that the sum of the months has been 328,330 in total, with twenty five missing days in June[76]. In order to avoid this distortion, the month of June has been replaced by 28,001 unique IP addresses, which increases the total value to 352,772. This information has to be taken with caution due to the impossibility of identifying if any of the IP addresses in one month is

[75] June is not considered in this classification due to the need of readjustment.
[76] The primary information for June identifies 3,559 unique IP addresses.

recurrent in other one, because of the non-availability of the primary data and current limitations of the used software. In other words, the amount presented as the total of the year here represents the sum of the total of each month, which, more than probably, does not necessarily coincide with the real number of unique IP addresses accessing the website during the whole year[77]. Anyway, the arithmetical mean for each month has been identified as 29,398 unique IP addresses per month. Similarly to what happens with the visitors, July and August are with significant difference the months with the lowest amount of unique IP addresses, but in this case March is the month with the highest value. Exactly as it happens with the total visitors, also in this case six months are over the mean, but February and June are only slightly below the mean value. Months can equally be classified into four groups by this feature, but changing the estimated values to around 38,000, over 30,000, around 25,000 and below 20,000 unique IP addresses. The months are exactly distributed among the groups as when dealing with the total amount of visitors.

Table 100
Unique IP addresses per month on the website of the Benaki Museum during 2008

Month	**N**
January	33,591
February	28,575
March	38,877
April	38,792
May	37,887
June	28,001*
July	18,115
August	15,972
September	25,181
October	30,501
November	32,498
December	24,782
Annual average	29,398**

Note: * The value with the missing values of June is 3,559 unique IP addresses.
** Average corrected.

Another very important feature to be analysed is the number of visits per IP address. This ratio expresses the repetition amount of visits by each IP. The closer the value to one, the less repetition of visits by each unique IP address. Taking into account the readjusted amount of visitors and unique IP addresses, the year 2008 in the Benaki Museum website

[77] This same limitation applies also to the analysis of the other two institutions.

presents a ratio of 1.38 visits per unique IP address. In other words, 72.6 per cent of the visits are made by different IP addresses. Looking at the different months of the year, the lowest values of this ratio are present in January (1.26), February (1.30) and March (1.31), whose values express that 79.5, 76.8 and 76.6 of the visits are made by different IP addresses. The highest values, on the contrary, are the ones scored by June (1.43), July (1.54) and August (1.58), where the different IP addresses represent 69.8, 65.0 and 63.2 of the total visits respectively. Among the remaining months, only May (1.38) and November (1.36) do not score a ratio of 1.39 visitors per IP address. The percentage of representation of the unique IP addresses in all these cases scores around 72.0 per cent of the total visitors. Calculating the mean of the different months of the year without consideration of the differences in the amount of the visitors between them, the monthly average ratio scores 1.39, which represents that 72.8 per cent of the visits are represented by unique IP addresses.

Table 101
Ratio of visitors per IP address and percentage per month on the website of the Benaki Museum during 2008

Month	**N**	**%**
January	1.26	79.5
February	1.30	76.8
March	1.31	76.6
April	1.39	72.2
May	1.38	72.3
June	1.43*	69.8
July	1.54	65.0
August	1.58	63.2
September	1.39	71.8
October	1.39	71.8
November	1.36	73.5
December	1.39	72.0
Annual average	1.38**	72.6
Annual monthly average	1.39**	72.8

Note: * The value with the missing values of June is 1.14.
** Average corrected.

When analysing the total number of pages viewed[78], the amount for 2008 in the website of the Benaki Museum is 4,979,011 that gives an average value of 414,918 pages per month. This mean value is exceeded merely by the months of January (453,741), May (595,403), September (547,544), October (442,261) and November (547,640). December (408,947) and March (394,246) are slightly below the average value per month and, finally, February

[78] The obtained data do not present the gaps identified when dealing with visitors and IP addresses in the month of June. Consequently, the values displayed here have not been adjusted for the research.

is the month with the lowest total amount of pages viewed by the virtual visitors, with 294,732. Consequently, the months with the highest amount of pages viewed are May and November and the one with the lowest amount is February.

Table 102
Pages viewed per month on the website of the Benaki Museum during 2008

Month	**N**
January	453,741
February	294,732
March	394,246
April	374,347
May	595,403
June	340,067
July	325,376
August	344,707
September	457,544
October	442,261
November	547,640
December	408,947
Annual average	414,918

Taking a closer look to the number of pages viewed by each visitor, the total amounts of the year 2008 for the Benaki Museum website give a result of 10.25 pages per visitor. This annual ratio is not reached only by the months of February (7.92), March (7.76), April (6.96) and June (8.48), whose ratios are in the best case nearly two pages below the annual value. On the other extreme, August (13.64), September (13.05) and November (12.39) exceed the annual value in more than two pages per visitor. The rest of the months score between 10.41 and 11.87 pages per visitor. If the mean value is obtained from the values of the different months with no distinction on the amount of visitors or pages, the average scores 10.52 pages per visitor.

Table 103
Ratio of pages viewed per visitor per month on the website of the Benaki Museum during 2008

Month	**N**
January	10.74
February	7.92
March	7.76
April	6.69
May	11.37
June	8.48
July	11.68
August	13.64
September	13.05
October	10.41
November	12.39
December	11.87
Annual average	10.25
Annual monthly average	10.52

If the ratio is obtained by the number of unique IP addresses and not of visitors, the annual value expresses that each IP address views 14.11 pages. The pattern in this case is exactly the same as the preceding one, but with different values. February (10.31), March (10.14), April (9.65) and June (12.14) are nearly two pages per IP below the annual average value in the best case, while August (21.58) and September (18.17) are more than four pages above this value. In this case, however, July is the third month with the highest ratio of pages viewed per IP address with a value of 17.96 and January does not reach the annual average value, because it scores 13.51 pages per IP. The rest of the months range between 14.50 and 16.85 pages per unique IP address. When the mean is obtained attending to the different months, it increases reaching 14.75 pages per unique IP.

Table 104
Ratio of pages viewed per IP address per month on the website of the Benaki Museum during 2008

Month	**N**
January	13.51
February	10.31
March	10.14
April	9.65
May	15.72
June	12.14
July	17.96
August	21.58
September	18.17
October	14.50
November	16.85
December	16.50
Annual average	14.11
Annual monthly average	14.75

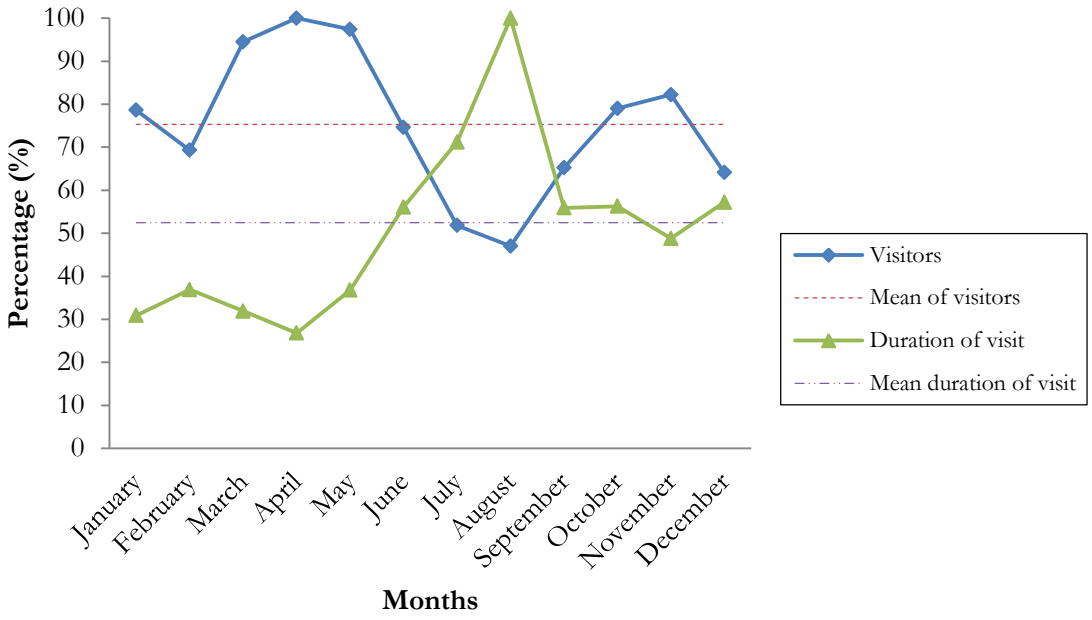
The last of the features analysed individually is the duration of the visit to the website of the Benaki Museum. Summing the duration of all the visits of the year to the site, the result scores 149,013,316 seconds in total, which identifies an annual mean duration of 331 second per visit. This mean value is not reached by the months of January (195), February (233), March (201), April (169), May (232) and November (308). In fact, only February and May do not have a difference of a hundred seconds with the mean, although they are really close to. On the other hand, July, with a mean duration of visit of 449 seconds, is more than one hundred seconds above the annual duration and August represents the most extreme case, whit a positive difference of 300 seconds in the mean duration of the visit. The remaining months have a difference of around 20 seconds on the average duration of visit. If the mean is obtained merely from the sum of the average duration of each month, the value decreases slightly, scoring 320 seconds per visit.

Table 105
Average duration of visit per month on the website of the Benaki Museum during 2008

Month	**N**
January	195
February	233
March	201
April	169
May	232
June	354
July	449
August	631
September	353
October	355
November	308
December	361
Annual average	331
Annual monthly average	320

In order to identify and delimit the general pattern of the Benaki Museum website, the research has also compared the patterns of the duration of the visit with the number of visitors, of unique IP addresses and of pages viewed. To make these comparisons feasible, the amounts have been transformed to percentages, taking the highest value of the year as a hundred per cent. This process avoids the non-possibility of comparison of features due to the huge differences on the values.

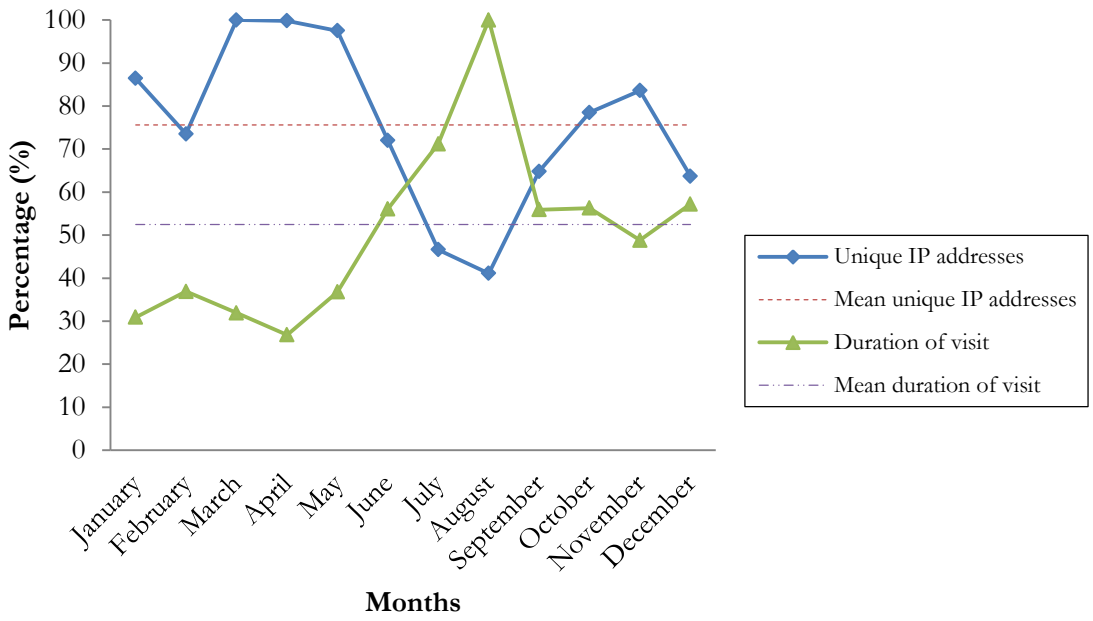
Looking at the pattern of both the duration of the visits, as well as of the number of visitors, in most of the cases a direct inverse relation can be identified, because, except for February and October, when one of the features scores a value below the annual average, the other one scores it above that value. In fact, the months with the highest duration of the visits display the lowest amount of visitors, as can be seen in the cases of July and August. On the contrary, the months with the highest amounts of visitors, namely, March, April and May, score three of the four lowest average duration of visit values. February has both values below the mean and October above it. January, March, April, May and November score visitors above the annual mean, but duration of visits below the annual value, whilst June, July, August, September and December show the opposite pattern.



Graph 1: Pattern of amount of visitors and duration of visit on the Benaki Museum during 2008

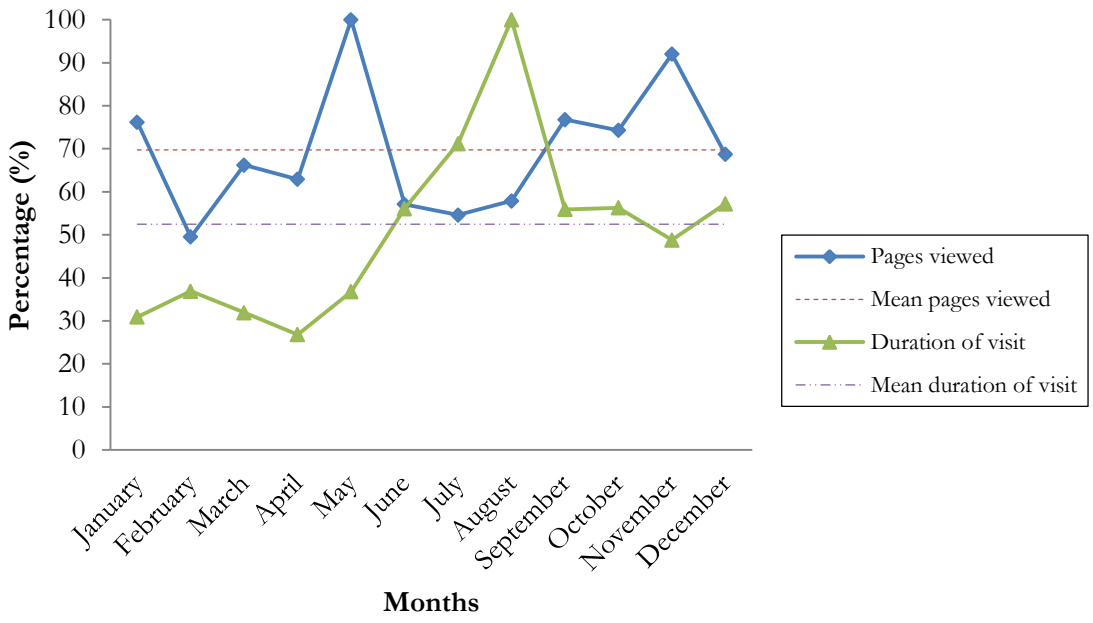
The same phenomenon has been observed when analysing the relation between the unique IP addresses and the duration of the visits. Except for February and October, the rest of the months present an inverse correlation between the number of unique IP addresses and the duration of the visits regarding the annual mean value. In fact, the four lowest average duration values are scored the same months that the amount of unique IP addresses is the highest. That is, January, March, April and May have the highest values of unique IP addresses, but the lowest mean duration of visits. Conversely, July and August have mean durations of visits significantly above the annual average, but are the only months where

the amount of the unique IP addresses does not reach 20,000. Thus, a general inverse relation is identified also in this combination of features.



Graph 2: Pattern of amount of unique IP addresses and duration of visit on the Benaki Museum during 2008.

Finally, the relation between the number of pages viewed per month and the average duration of visits is not as clear as the previous ones. Actually, some of the months have both values below the annual average, others both above that value and others combine one value above the mean with other below it. January, May and November are months with more pages viewed than the annual mean, but a lower duration of the visit. June, July, August and December have fewer pages viewed than the mean, but longer visits. February, March and April have both features below the mean, while September and October present values above the mean. So, there is no clearly identifiable relation between the total number of pages viewed in one month and its average duration of the visit.



Graph 3: Patterns of amount of pages viewed and duration of visit on the Benaki Museum during 2008.

Summing up, the website of the Benaki Museum presents some identifiable characteristics on the pattern of global visitor use patterns. March, April and May are the months with the highest amount of both visitor number and unique IP addresses, but three of the four lowest duration of the visits. This pattern reverses during July and August, because the highest values of duration of visits are accompanied by the lowest ones in terms of visitors and unique IP addresses. In fact, these two months are also the ones with the highest ratio of visitors per IP address, which identifies that the repetition of visit rate is higher than the mean. March and April also score the lowest pages viewed per visitor and pages viewed per IP address ratios, while in both cases August presents the highest values of these ratios. Therefore, two easily identifiable extreme periods can be described for the Benaki Museum website. On the one hand, the period that comprises the months of March, April and May with a high volume of traffic of visitors for a shorter visit with the display of fewer pages. On the other, the one consisting of fewer visitors but longer visits with the display of more pages that embraces mainly the months of July and August.

4.2.1.2.- Diocesan and Regional Museum of Lleida

The Diocesan and Regional Museum of Lleida, as its name states, is located in Lleida (Catalonia, Spain) and its holdings consist of assets from the diocesan collection, as well as the content of the archive of the ancient Diocesan Museum of Lleida. In global terms, during 2008, the website of the Diocesan and Regional Museum of Lleida has been the one

with the lowest values in all the analysed features among the selected institutions. During the whole year, this institution received a total amount of 71,182 virtual visitors, among whom 52,544 have been identified as unique IP addresses. These IP addresses represent 73.8 per cent of the total amount of virtual visitors and give a result of 1.36 average visitors per IP. The total amount of pages viewed during 2008 scores 313,433 and the number of total hits 1,390,491. Thus, the annual rate of hits per page on the website of the Diocesan and Regional Museum of Lleida during 2008 has been of 4.44. Considering the total amount of visitors and unique IP addresses, the annual mean of pages viewed per visitor is 4.40 and per unique IP addresses 5.97. Lastly, the total amount of seconds spent during 2008 on the website of the Diocesan and Regional Museum of Lleida has been 22,894,740, which gives a value of an annual average visit of 322 seconds per visitor, 436 per unique IP address and 73 seconds per page.

Table 106
Summary table of the data about the website of the Diocesan and Regional Museum of Lleida during 2008

Feature	N
Visitors	71,182
Unique IP addresses	52,544
Visitors per IP address	1.36
Total pages viewed	313,433
Total number of hits	1,390,491
Hits per page	4.44
Pages viewed per visitor	4.40
Pages viewed per IP address	5.97
Total seconds spent on the website	22,894,740
Annual average seconds per visitor	322
Annual average seconds per IP address	436
Annual average seconds per page	73

As happens with the Benaki Museum, also the Diocesan and Regional Museum of Lleida website has some informational gaps due to thirteen missing values during January 2008[79]. In this case, however, data have not been readjusted because the preceding month, namely December 2007, has not been included in the research and it has not been possible to calculate a mean value to replace the month. Moreover, even though it alters the result, the distortion is not as great as in the case of the Benaki Museum.

As mentioned before, the total amount of visitors to the website of the Diocesan and Regional Museum of Lleida during 2008 was of 71,182 virtual visitors and, consequently,

[79] In this case, the staff of the Òliba Research Group of the Universitat Oberta de Catalunya, which manages the information about the logs of the website, identified that the server was down during those days.

the average amount of visitors per month has been 5,932. The distribution of the visits is not homogeneous and presents peak months of higher visitor traffic and others of significantly lower. Actually, the months of April and May triple the amount of visitors of September and nearly of August and January, although the latter presents the previously mentioned missing values. In the case of the Diocesan and Regional Museum of Lleida, during 2008 only four months present values over the mean, namely March, April, May and June. Among them, April and May have an amount of visitors over 10,000, while March and June are around the annual mean. The rest of the months are below the average, but January, August, September and December present values even below 4,000 visitors per month. Therefore, four groups can be identified regarding the amount of visitors: the ones that exceed greatly the average and have more than 10,000 visitors; the ones over the mean and 6,000 visitors; the ones between 5,500 and 5,000 virtual visitors; and the ones with less than 4,000 visitors. April and May are part of the first group; March and June are the members of the second group; February, July, October and November represent the third one and the group with the lowest amount of visitors consists of January, August, September and December.

Table 107
Visitors per month to the website of the Diocesan and Regional Museum of Lleida during 2008

Month	**N**
January	3,729*
February	5,491
March	6,956
April	10,984
May	10,974
June	6,213
July	5,180
August	3,730
September	3,535
October	5,434
November	4,968
December	3,988
Annual average	5,932

Note: * The month of January presents 13 missing values.

When looking at the pattern of visits of unique IP addresses, it is exactly the same as with the visitors, with the exceptions of the months of February and June. The total amount of the sum of the unique IP addresses that have visited the website of the Diocesan and Regional Museum of Lleida during 2008 has been of 52,544, which represents an arithmetical mean of 4,379 per month. Also in this case, the months that were below the

mean in terms of visitors display values below the mean of unique IP addresses per month and, conversely, the ones above that value regarding visitors are similarly above it when dealing with IP addresses. The only exceptions are the months of February and June. The first one has fewer visitors than the mean, but more unique IP addresses, while the latter, even though it is quite close to the annual average value, the other way round. August and September represent the months with the lowest amount of unique IP addresses, with values in both cases below 2,500. The other only month that does not reach a total of 3,000 unique IP addresses has been December, becoming the third month with the lowest amount. January, conversely, is the third month with the fewer visitors, but in terms of unique IP addresses is placed on the fourth place. On the other hand, April and March are the months with the highest amounts of unique IP addresses and the first of them nearly quadruples the amount of August. The fact that these months have a great difference with the rest of the months in terms of IP addresses causes that only four months are above the annual mean, namely, February, March, April and May. As mentioned before, June is slightly below the mean. Similarly to what happens with the total visitors, months can be divided into four groups: the ones with values over 8,000; the ones between 6,000 and 4,000 unique IP addresses; the ones with more than 3,000; and the ones even below 3,000 unique IP addresses. Logically, April and May belong to the first group; February, March and June are part of the second one; the third group consists of the months of January, July, October and November, while August, September and December represent the group with the lowest number of unique IP addresses.

Table 108
Unique IP addresses per month on the website of the Diocesan and Regional Museum of Lleida during 2008

Month	**N**
January	3,200*
February	4,649
March	5,866
April	8,617
May	8,299
June	4,225
July	3,590
August	2,246
September	2,410
October	3,300
November	3,301
December	2,841
Annual average	4,379

Note: * The month of January presents 13 missing values.

The pattern of the number of visitors per IP address is completely related to the previous two features. The website of the Diocesan and Regional Museum of Lleida presents an annual ratio of 1.35 visitors per IP address or, in other words, 73.8 per cent of the visits are performed by different IP addresses. Contrarily to what happens with the unique IP addresses, in this case seven months present a ratio higher than the annual mean. In fact, January (1.17), February and March (1.19) are the only months not only in the Diocesan and Regional Museum of Lleida, but in the three institutions analysed in this section, that score a value below 1.20. Consequently, these three are the months were the repetition of visits has been less frequent, with 85.8, 84.7 and 84.3 per cent of unique IP addresses. On the other hand, August and October are the months with the highest values, scoring 1.66 and 1.65 respectively. These values express that 60.2 per cent of the visits during August were performed by unique IP addresses and 60.7 of the ones in October. Also November shows a significant ratio of 1.50 that means that the percentage of representation of the unique IP addresses is of 66.4 per cent. June and September present the same visitor per IP ratio (1.47), but their percentages of visits per IP address are different, scoring 68.0 the first one and 68.2 per cent the latter. Among the rest of the months, only May (1.32) and April (1.27) do not reach a ratio of 1.40, with a percentage of representation of the IP addresses of 75.6 and 78.5 per cent of the total of visits respectively. Calculating the mean of the values of the different months, the result shows a mean of 1.39 visitors per IP, which expresses that 72.7 per cent of the total visits are performed by unique IP addresses.

Table 109
Ratio of visitors per IP address and percentage per month on the website of the Diocesan and Regional Museum of Lleida during 2008

Month	**N**	**%**
January	1.17	85.8
February	1.19	84.7
March	1.19	84.3
April	1.27	78.5
May	1.32	75.6
June	1.47	68.0
July	1.44	69.3
August	1.66	60.2
September	1.47	68.2
October	1.65	60.7
November	1.50	66.4
December	1.40	71.2
Annual average	1.36	73.8
Annual monthly average	1.39	72.7

Regarding the pages viewed, the total amount during the year 2008 of the website of the Diocesan and Regional Museum of Lleida is 313,433, giving an average value of 26,119 pages viewed per month. This mean value is exceeded by half of the year, while the other half shows values below the average. Values, however, are quite homogeneous, except for the months of January, May, June and July. The first one, probably due to the missing values, displays a value of 16,183 pages viewed, while the other three months represent the peak of the amount of pages viewed per month, with values in all cases above 30,000. Actually, May is the month with the highest amount of pages viewed (32,572), followed by July (32,141) and June (30,775). Among the rest of the months, only April, October and December are over the average annual value, but below the amount of 30,000 pages viewed per month. The rest of the months show values above 22,000. Consequently, the months with the highest amount of pages viewed are May, June and July and the one with the lowest amount is January.

Table 110
Pages viewed per month on the website of the Diocesan and Regional Museum of Lleida during 2008

Month	**N**
January	16,183
February	24,677
March	23,879
April	28,730
May	32,572
June	30,775
July	32,141
August	22,833
September	22,002
October	27,576
November	25,378
December	26,687
Annual average	26,119

Note: * The month of January presents 13 missing values.

Looking at the number of pages viewed by each visitor, the annual average of 2008 for the website of the Diocesan and Regional Museum of Lleida scores 4.40 pages. Only four months do not reach this value in this case, namely, January, March, April and May, even though the first one presents a ratio of 4.34 pages per visitor. The other ones score respectively ratios of 3.43, 2.62 and 2.97. Therefore, these three months have a negative difference of one page viewed per visitor. On the other hand, December (6.69), July (6.20) and August (6.12) have a ratio above six pages per visitor and November (5.11), September

(5.07) and October (5.07) above five. Finally, February (4.49) and June (4.95) are over the mean but with not a huge difference. If the mean is obtained from the monthly values, it increases to 4.76 pages per visitor.

Table 111
Ratio of pages viewed per visitor per month on the website of the Diocesan and Regional Museum of Lleida during 2008

Month	**N**
January	4.34
February	4.49
March	3.43
April	2.62
May	2.97
June	4.95
July	6.20
August	6.12
September	5.07
October	5.07
November	5.11
December	6.69
Annual average	4.40
Annual monthly average	4.76

Analysing this ratio from the perspective of the unique IP addresses, the annual average shows a value of 5.99 pages per IP. In this case, the first five months of the year lay below the annual mean, with April expressing the lowest ratio value (3.33). In fact, March (4.07), April (3.33) and May (3.92) are two pages below the mean. On the contrary, July (8.95), August (10.17), September (9.13), October (8.36) and December (9.39) are more than two pages above the mean value. In fact, from the months above the mean, only June (7.28) and November (7.69) do not reach that difference. As can be seen, August is the month with the highest ratio and April the one with the lowest value. When the mean is obtained from the monthly values, the ratio per unique IP address gives a result of 6.89 pages.

Table 112
Ratio of pages viewed per IP address per month on the website of the Diocesan and Regional Museum of Lleida during 2008

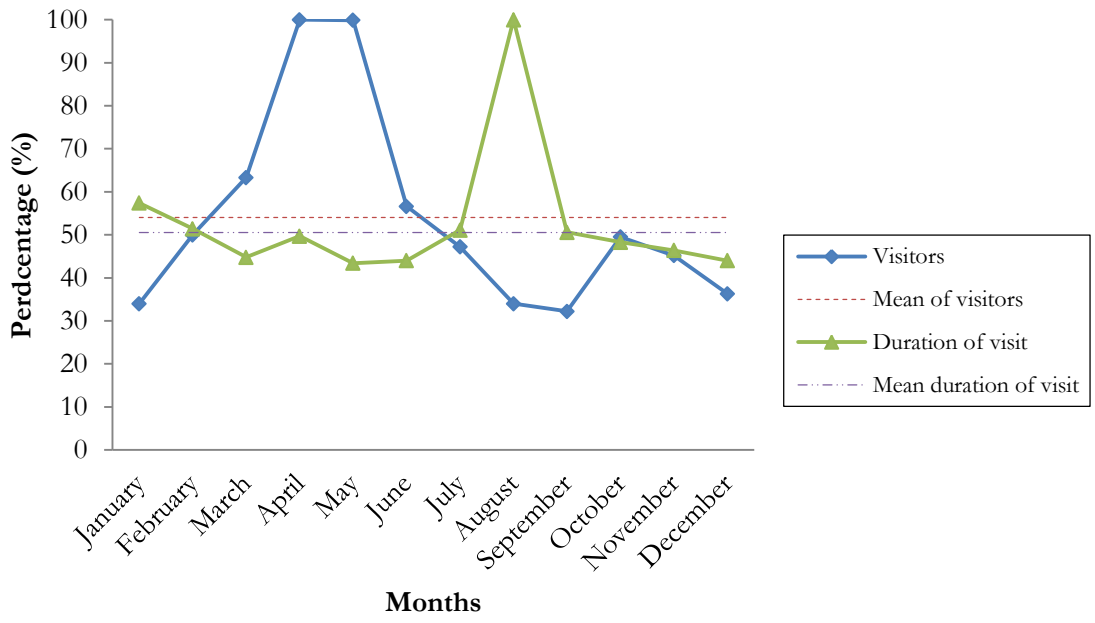
Month	**N**
January	5.06
February	5.31
March	4.07
April	3.33
May	3.92
June	7.28
July	8.95
August	10.17
September	9.13
October	8.36
November	7.69
December	9.39
Annual average	5.97
Annual monthly average	6.89

When the analysed feature is the duration of the visits, the sum of the seconds spent on the website of the Diocesan and Regional Museum of Lleida is 22,894,740. The annual mean obtained from this amount is 322 seconds per visit. This mean is not reached by the months of March (286), April (317), May (277), June (281), October (308), November (296) and December (281), but the biggest difference is in this case of 41 seconds. Similarly to what happens with the Benaki Museum, July (326), August (638) and September (323) are above the mean, but the first and the last one are below the values of January (366) and February (328). The differences in this case, however, are at the most of 44 seconds, except for August, which nearly doubles the annual average value. Obtaining the mean from the values of each month with no differentiation of visits number, the value increases slightly, scoring a duration of 336 seconds per visit.

Table 113
Average duration of visit per month on the website of the Diocesan and Regional Museum of Lleida during 2008

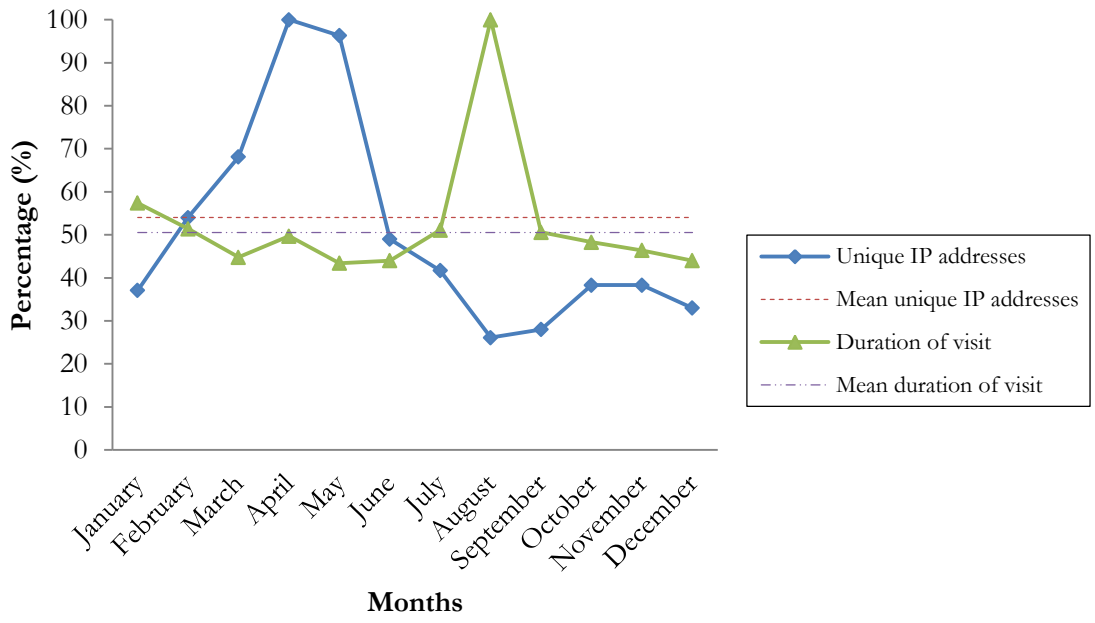
Month	**N**
January	366
February	328
March	286
April	317
May	277
June	281
July	326
August	638
September	323
October	308
November	296
December	281
Annual average	322
Annual monthly average	336

To identify the general pattern of the Diocesan and Regional Museum of Lleida, the research compares both the duration of the visits and the number of visitors simultaneously. In most of the cases, a direct inverse correlation has been identified with one value over the annual average and the other one below it. Anyway, the month of October, November and December have both values below the annual average. January, February, July, August, September and October have a longer duration of visit than the average, but a lower number of visitors. March, April, May and June, on the other hand, present the contrary pattern. May presents the second highest amount of visitors and the lowest duration of the visits, while August has the second lowest amount of visitors and the longest duration of visits. Among the rest of the months, this relation does not take place so clearly, except for January, where the second longest duration of the visit coincides with the lowest amount of visitors.



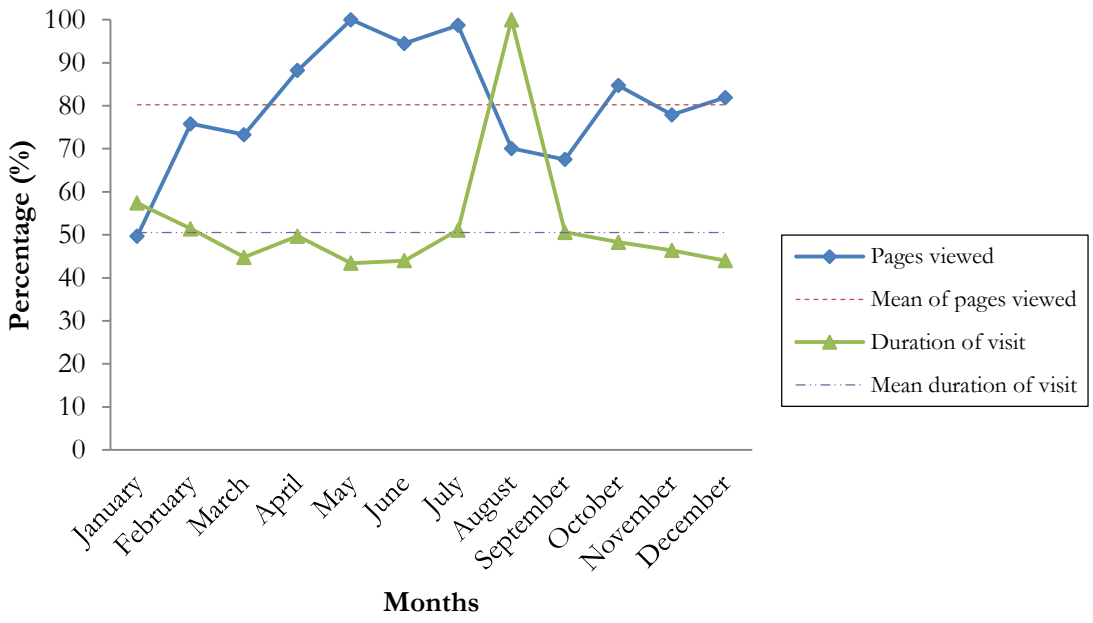
Graph 4: Pattern of amount of visitors and duration of visit on the Diocesan and Regional Museum of Lleida during 2008.

The same pattern is repeated when dealing with the unique IP addresses. Only February and June do not repeat the pattern, because the first one has both values over the annual means the latter both below. October, November and December have again both values below the annual average. January, July, August and September show a longer duration than the mean and fewer unique IP addresses, whilst March, April and May present the exactly contrary pattern. In this case, August is the month with the longest duration, but the least unique IP addresses and May presents the shortest duration with the second highest amount of IP addresses. The rest of the months do not show this relation as clearly as the previous ones.



Graph 5: Pattern of unique IP addresses and duration of visits on the Diocesan and Regional Museum of Lleida during 2008.

The last relation is the one of the number of pages viewed per month with the duration of the visit. Among the months, three of them present a direct relation with both values below the means, such as March and November, or both above them, such as July. The month of May is the one with the shortest duration of visit, but the highest amount of pages viewed. June also presents the second shortest duration of visit and the third highest amount of pages viewed. April, May, June, October and December have a shorter duration of visits and a higher amount of pages viewed. January, February, August and September, on the other hand, present a longer visit, but fewer pages viewed. So, even though the direct inverse relation is not exact, it can be identified more easily than in the case of the Benaki Museum. Anyway, a totally inverse direct relation cannot be clearly stated.



Graph 6: Pattern of pages viewed and duration of visits on the Diocesan and Regional Museum of Lleida during 2008.

Summing up, the website of the Diocesan and Regional Museum of Lleida shows clear patterns. April and May are the months with the highest amount of visitors and unique IP addresses, but the shortest visits take place during May, June and December. April and May are also the months with the lowest ratios of pages per both visitors and IP addresses. August, on the contrary, presents the longest duration of visits, the lowest amount of IP addresses and the second lowest of visitors. Surprisingly, August also displays the third lowest amount of pages viewed in total. So, April and May belong to the period with shorter but more numerous visits, while August is the month that represents the period with a significantly longer duration of visits, but a lower amount of them. Among the rest of the months, the pattern is more homogeneous although there is a variation of their values.

4.2.1.3.- Pitt Rivers Museum

The Pitt Rivers Museum of the University of Oxford (United Kingdom) is an anthropology museum established by the lieutenant Pitt Rivers on 1884. This museum and its website is, consequently, closely linked to the academic and research world. The Pitt Rivers Museum is the only one of the three selected institutions with no missing values at all. The ICT Department of the museum is the responsible of data gathering and analysis. The availability of the primary sources has allowed the research not only to successfully analyse

the website of the institution in this section, but also on the remaining following ones. Analysing the whole year[80], the website of the Pitt Rivers Museum has received a total of 725,305 visitors, of whom 550,687 have been unique IP addresses. These two values are the highest ones among the three analysed institutions. The percentage of representation of the unique IP addresses is 75.9 per cent and expresses a ratio of 1.32 visitors per IP. In terms of viewed pages, however, the Pitt Rivers Museum drops to the second place with a total amount of 1,843,517 pages during 2008. The number of total hits, in this case, is 9,379,033, with an average of 5.09 hits per page on the website. Analysing the annual amount of pages viewed per visitor and IP address, the analysis shows a ratio of 2.54 for the first one and of 3.35 for the latter. Finally, the main site of the Pitt Rivers Museum website has been visited during a total of 164,022,649 second, giving as a result an annual average duration of 221 seconds per visitor, of 298 per IP address and of 89 second per page viewed.

Table 114
Summary table of the data about the website of the Pitt Rivers Museum during 2008

Feature	N
Visitors	725,305
Unique IP addresses	550,687
Visitors per IP address	1.32
Total pages viewed	1,843,517
Total number of hits	9,379,033
Hits per page	5.09
Pages viewed per visitor	2.54
Pages viewed per IP address	3.35
Total seconds spent on the website	164,022,649
Annual average seconds per visitor	221
Annual average seconds per IP address	298
Annual average seconds per page	89

In terms of virtual visitors, the Pitt Rivers Museum is the institution with the highest amount of all the three selected ones. During the whole 2008, a total of 725,305 virtual visitors have accessed the website of the Pitt Rivers Museum and, consequently, the annual average scores 60,442 visitors per month. This mean value is not reached by six months, while the other six show values above it. January, February, July, August, November and December are below the annual average. August (48,293), December (50,966) and January (51,630) are the months with the lowest amount of visitors among them. On the other hand, March, April, May, June, September and October are above the average annual value,

[80] This part of the research deals merely with the main site of the Pitt Rivers Museum website. The resources and projects of the website of the Pitt Rivers Museum will be analysed on a subsequent section.

being May (72,447), September (72,079) and April (67,800) the months with the most intense traffic of virtual visitors to the Pitt Rivers Museum website. Analysing the amount of visitors, months can be divided into four groups: the months with more than 65,000 visits; the ones with values between 65,000 and 60,000 visitors; the ones over 55,000; and the ones below this value. April, May, September and October are part of the first group; March, June and November belong to the second one; the third group consists of February and July; while January, August and December represent the group with the lowest amounts.

Table 115
Visitors per month to the website of the Pitt Rivers Museum during 2008

Month	**N**
January	51,630
February	55,946
March	62,026
April	67,800
May	72,447
June	61,808
July	56,801
August	48,293
September	72,079
October	65,080
November	60,429
December	50,966
Annual average	60,442

Analysing the pattern of the unique IP addresses that have visited the Pitt Rivers Museum website during 2008, the pattern is the same as the one of the virtual visitors, except for the month of November. The total amount of unique IP addresses has been 550,687, placing the website of the Pitt Rivers Museum on the top of the three selected institutions. Taking this amount as a basis, the annual average mean scores 45,891 unique IP addresses per month. This mean value is exceeded by seven months, because November is added to the ones that show this pattern regarding the total virtual visitors. Thus, March, April, May, June, September, October and November are over the annual average value, while January, February, July, August and December are below it. The months with the highest amounts of unique IP addresses are September (58,716), October (51,406) and May (51,341) and the ones with the lowest August (35,877), January (38,058) and December (41,539). Taking the months globally, they can be divided into four groups: the ones over 50,000 unique IP addresses; the months over the mean; the ones below the mean but above 40,000 IP addresses; and the ones below this value. The first group consists of May, September and

October; March, April, June and November are part of the second one; February, July and December belong to the third group; and January and August represent the group with the lowest amount of IP addresses.

Table 116
Unique IP addresses per month on the website of the Pitt Rivers Museum during 2008

Month	**N**
January	38,058
February	42,039
March	46,961
April	48,599
May	51,341
June	46,014
July	42,235
August	35,877
September	58,716
October	51,406
November	47,902
December	41,539
Annual average	45,891

When total visitors and unique IP addresses are analysed jointly, the annual ratio of visitors per IP address during 2008 in the website of the Pitt Rivers Museum has been 1.32, with a representation of the total visits by the different IP addresses of 75.9 per cent. Only September (1.22), October (1.27), November (1.26) and December (1.23) do not reach this value and, in fact, these months have a representation around four fifths of the total with 81.5, 79.0, 79.3 and 81.5 respectively. On the other hand, May (1.41) and April (1.40) are the months with the highest ratio and the lowest percentage with their respective 70.9 and 71.7 each one. Among the remaining months, only January (1.36) and August (1.35) show ratios of at least 1.35. These months show representation percentages of 73.7 and 74.3 per cent respectively. If the annual mean is calculated taking as a basis the values of the different months, in this case the value remains the same as the global annual one, namely, 1.32, which represents 76.0 of the monthly virtual visitors.

Table 117
Ratio of visitors per IP address and percentage per month on the website of the Pitt Rivers Museum during 2008

Month	N	%
January	1.36	73.7
February	1.33	75.1
March	1.32	75.7
April	1.40	71.7
May	1.41	70.9
June	1.34	74.4
July	1.34	74.4
August	1.35	74.3
September	1.22	81.5
October	1.27	79.0
November	1.26	79.3
December	1.23	81.5
Annual average	1.32	75.9
Annual monthly average	1.32	76.0

Taking a closer look to the number of pages viewed, the total amount of this feature during 2008 in the website of the Pitt Rivers Museum has been of 1,343,517, giving an average value of 153,626 pages per month. This value is exceeded by the first five months with a minimum difference of 50,000 pages. Among these months, May (204,026) and February (209,047) are the ones with this difference, while it increases to 70,000 when dealing with April (221,823), January (226,256) and March (235,624). June (125,440) is the month of the remaining ones closer to the mean, because in the rest the negative difference is of at least 35,000 pages. The most extreme month is December (88,666), with a negative difference of around 70,000 pages. Consequently, the month with the highest amount of pages viewed is March and the one with the lowest December.

Table 118
Pages viewed per month on the website of the Pitt Rivers Museum during 2008

Month	N
January	226,256
February	209,047
March	235,624
April	221,823
May	204,026
June	125,440
July	115,270
August	103,702
September	100,343
October	110,886
November	102,434
December	88,666
Annual average	153,626

Analysing the number of pages viewed per visitor, the annual average value is 2.54 pages. This annual ratio is reached by the months of January (4.38), February (3.74), March (3.80), April (3.27) and May (2.82), with a difference of around two pages in the case of the first one of them. The rest of the months are below the annual mean. Among them, August is the months with the highest ratio (2.15) and September the one with the lowest (1.39). December (1.74), October ((1.70) and November (1.70) show ratios below two, while June (2.03) and July (2.03) are slightly above it. If the annual value is obtained from the values of each month, it scores 2.56 pages per visitor.

Table 119
Ratio of pages viewed per visitor per month on the website of the Pitt Rivers Museum during 2008

Month	**N**
January	4.38
February	3.74
March	3.80
April	3.27
May	2.82
June	2.03
July	2.03
August	2.15
September	1.39
October	1.70
November	1.70
December	1.74
Annual average	2.54
Annual monthly average	2.56

Obtaining the ratio by unique IP addresses, the pattern is exactly the same, but scoring different values. The annual ratio in this case is 3.35, which is reached also by the month of January (5.95), February (4.97), March (5.02), April (4.56) and May (3.97). Similarly to the previous analysis, January is the month with the highest difference with the mean, scoring more than two pages per IP address above this value. On the contrary, September is the month with the lowest ratio (1.71), which is nearly half of the annual average. The rest of the months, namely, June (2.73), July (2.73), August (2.89), October (2.16), November (2.14) and December (2.13) present ratios below the annual mean, but above two pages per IP address. If this annual value is obtained from the monthly values, it increases slightly to 3.41 pages per IP addresses.

Table 120
Ratio of pages viewed per IP address per month on the website of the Pitt Rivers Museum during 2008

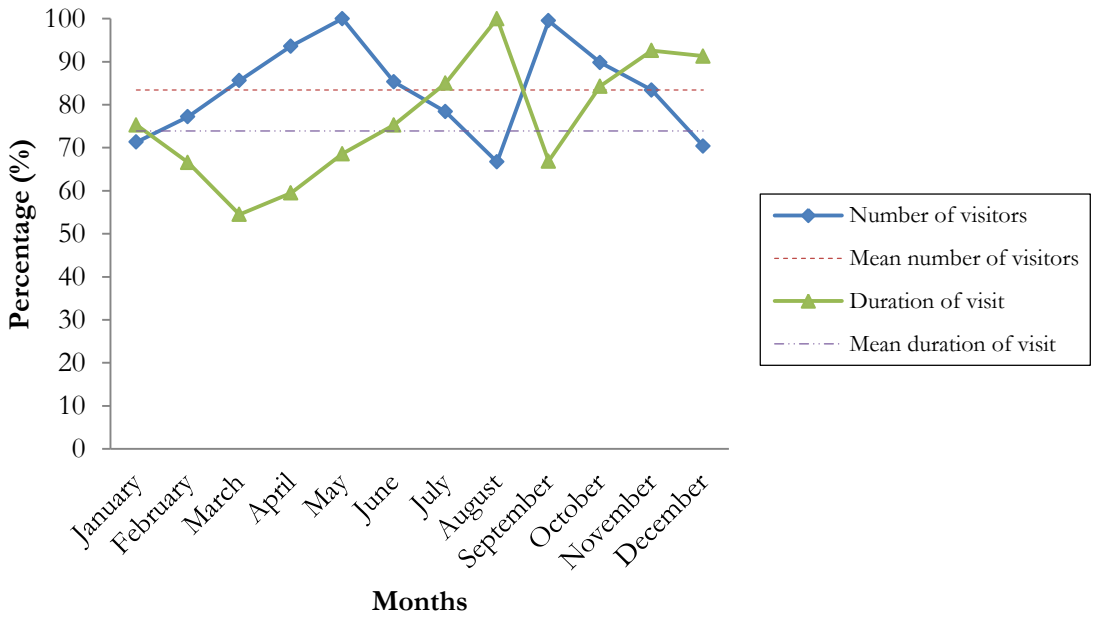
Month	**N**
January	5.95
February	4.97
March	5.05
April	4.56
May	3.97
June	2.73
July	2.73
August	2.89
September	1.71
October	2.16
November	2.14
December	2.13
Annual average	3.35
Annual monthly average	3.41

When the duration of the visits during 2008 in the website of the Pitt Rivers Museum is analysed, a total of 164,022,649 seconds have been spent globally on it, which gives as a result an annual mean duration of 221 seconds per visit. This mean value is not reached by the months of February (199), March (163), April (178), May (205) and September (200). Among them, March is the month with the shortest duration per visit, with a difference of around sixty seconds regarding the annual mean. On the contrary, January (225), June (225), July (254), August (299), October (252), November (277) and December (273) are above the annual mean, with a maximum difference of nearly eighty seconds in the case of August. Thus, March represents the month with the shortest duration and August the one with the longest one. If the annual duration mean is obtained from the values of the different months, it shows an average duration of 229 seconds per visit.

Table 121
Average duration of visit per month on the website of the Pitt Rivers Museum during 2008

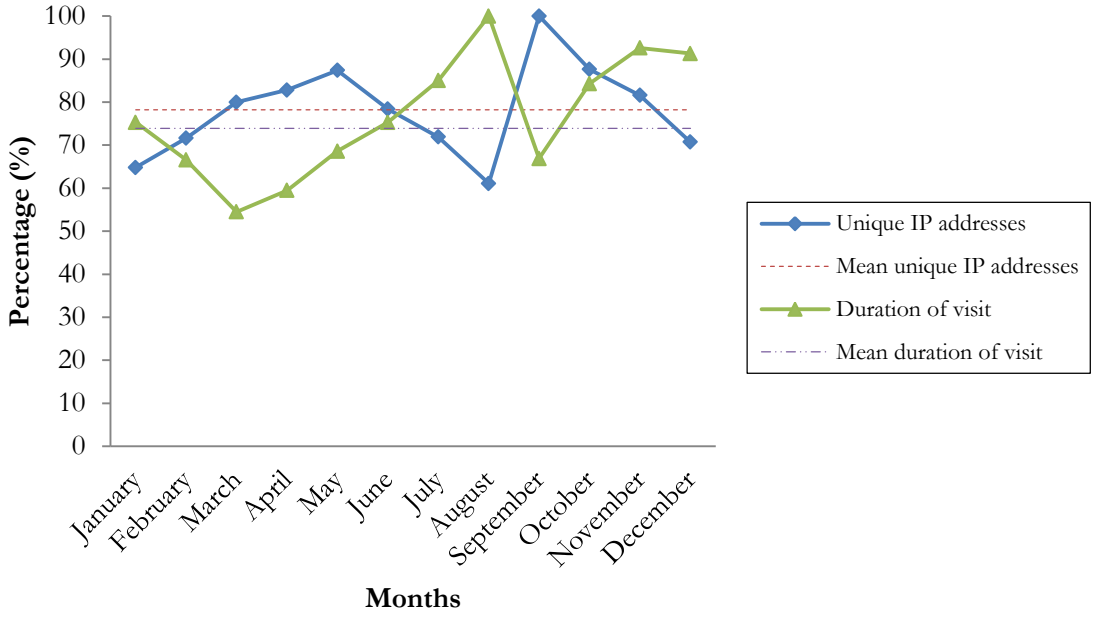
Month	N
January	225
February	199
March	163
April	178
May	205
June	225
July	254
August	299
September	200
October	252
November	277
December	273
Annual average	221
Annual monthly average	229

Looking at the combined pattern of the visit duration and the number of visitors, there is a clear inverse direct correlation in the case of nine months. In fact, March, April, May and September have a shorter mean duration of the visit than the annual value, but a higher amount of virtual visitors. Conversely, January, July, August, November and December present the same pattern, but inverting the values above and below the annual means. February scores both values below the respective annual means, whilst June and October have both above the average values. This last month represents one of the highest values in terms of number of virtual visitors and duration of visits. August, on the other hand, presents the lowest amount of virtual visitors but the longest duration of visits.



Graph 7: Pattern of amount of visitors and duration of visit on the Pitt Rivers Museum during 2008.

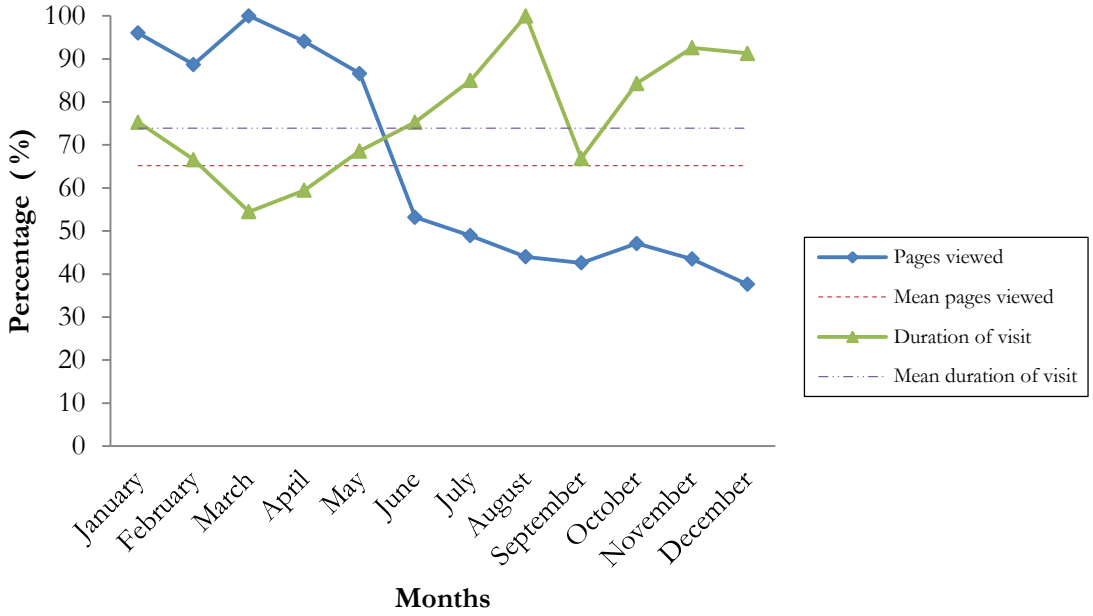
Analysing the pattern of the duration of visit and the number of unique IP addresses, the pattern is exactly the same as the previous one, except for the month of November, which in this case have both values above the annual means. June and October also present this pattern, while February displays both values below the respective means. The months with longer duration of visits than the mean but fewer visitors are January, July, August and December and the ones with the contrary pattern are March, April, May and September. Also in this case, the month of August shows the longest duration of the visits with the lowest number of unique IP addresses.



Graph 8: Pattern of amount of unique IP addresses and duration of visit on the Pitt Rivers Museum during 2008.

The final relation to be analysed is the one of the number of pages viewed and the duration of the visits. Conversely to the other two institutions, a clearer inverse relation can be identified between these two features. Except for January and September, all the months have a value over the mean and the other one below it. Actually, February, March, April and May have a higher amount of pages viewed with a shorter duration of the visit, whilst June, July, August, October, November and December present the contrary pattern. January is the only month with both values over the mean and September the only one with both of them below the average values. The month of December shows with great difference the lowest amount of pages viewed, but the third longest duration of visits.

Conversely, March is the month with the highest amount of pages viewed and the shortest duration of the visits. February and April are the other months with the shortest duration of visit and the third and fourth highest amount of pages viewed. January, conversely, has the second highest amount of pages viewed and a duration around the annual mean.



Graph 9: Pattern of amount of pages viewed and duration of visit on the Pitt Rivers Museum during 2008.

Summing up, the website of the Pitt Rivers Museum has some specific characteristics and other ones that shares with the other two institutions. August is the month with the lowest number of virtual visitors and unique IP addresses but the longest mean duration of visit. The months with the highest number of virtual visitors and unique IP addresses are divided into two different periods, namely, April and May on the one hand and September and October on the other. Except for October, these months score three of the five shortest durations of visit. September, however, scores the second lowest amount of pages viewed but the second highest amount of virtual visitors. December, on the other hand, presents the lowest amount of pages viewed and the third longest duration of visit. Equally, January has the third lowest amount of visitors but the second highest one in terms of pages viewed and a duration of visit slightly above the annual mean value. Contrarily, March shows the shortest duration of visits but the highest amount of pages viewed by the virtual visitors of this month. Consequently, the pattern of use of the main section of the website of the Pitt Rivers Museum cannot be as clearly identified as on the previous cases. However, there is a characteristic that can be clearly stated. Except for the amount of pages

viewed each month, the Pitt Rivers Museum shows a more balanced model regarding number of virtual visitors, unique IP addresses and duration of visits. The differences between the mean annual value in these cases and the most extreme ones are not as big as on the other analysed institutions.

4.2.1.4.- Comparison of the patterns of the three institutions

In order to perform an accurate comparison, values of the different institutions have been transformed into percentages, taking the highest value of the year as a reference of the total. This process has been carried out to avoid the great differences of amount between the three institutions. The selected features to perform this comparison have been the number of virtual visitors, the number of unique IP addresses, the ratio of visitors per IP address, the number of pages viewed, the ratio of pages viewed by visitor and the duration of visit.

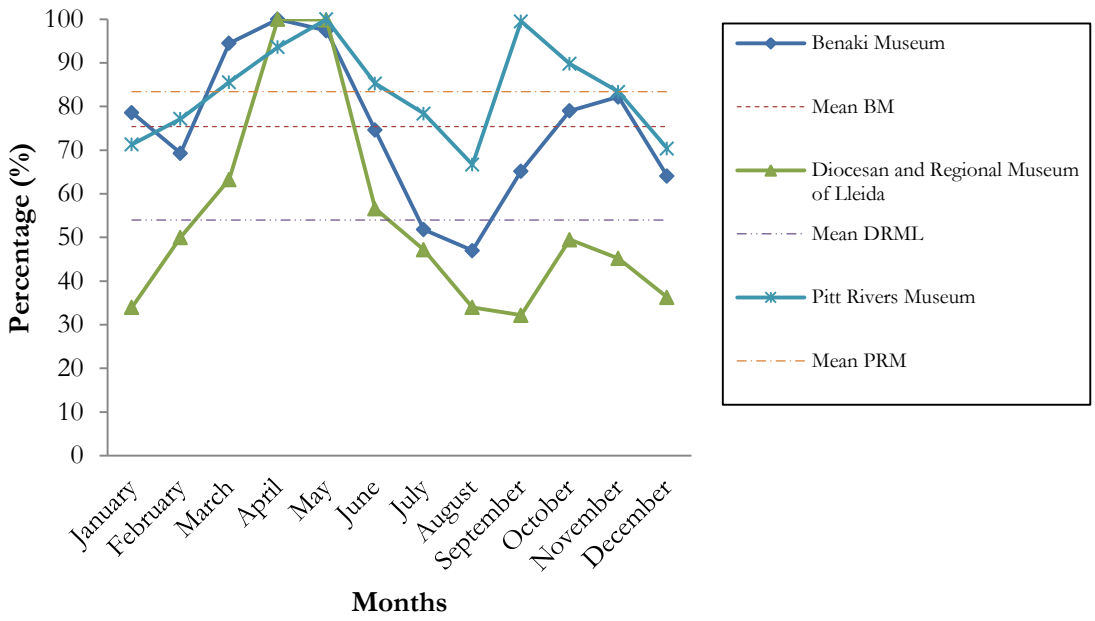
Regarding the number of visitors, the first difference is the total amount of virtual visitors during 2008. In this case, the Pitt Rivers Museum is the institution with the highest amount and the Diocesan and Regional Museum of Lleida the case with the lowest one. In fact, the amount of the latter one represents about a tenth of the total amount of visitors of the Pitt Rivers Museum. Obviously, this same pattern applies to the average of visitors per month, but, taking into account that the highest value of the year represents a hundred per cent in the transformation process, the percentage of the annual average varies quite significantly. Actually, the mean of the Diocesan and Regional Museum of Lleida also in this case represents the lowest value with a percentage of 54.0 per cent. The Benaki Museum, on the other hand, has an annual average amount that represents 75.3 of the highest value of the year, while the annual average of the Pitt Rivers Museum scores 83.4 in this case. Looking at the months with the most intense traffic of virtual visitors, the Benaki Museum has its peak during March, April and May and the Diocesan and Regional Museum of Lleida during April and May. The Pitt Rivers Museum, conversely, also shows the highest peak on May, but the second month with the highest amount of visits is September. In the three cases, however, the month with the lowest amount of visitors is August, but the percentage of the month with regard to the highest amount differs considerably. This value in the case of the Pitt Rivers Museum represents 66.7 per cent, being the only institution with it over a half. Slightly below the half, the Benaki Museum presents a percentage of 47.0, whilst the Diocesan and Regional Museum of Lleida shows the lowest percentage with only 34.0 per

cent. In fact, the value of this percentage is linked to the balance and stability of the model of the institution. The Pitt Rivers Museum only has August below a percentage of 70.0 per cent and the Benaki Museum two below 60.0. The Diocesan and Regional Museum of Lleida, on the contrary, even having two months scoring nearly a hundred per cent, presents seven months below the threshold of 50.0 regarding the maximum of the year. Consequently, different model of virtual visitors' amount variation can be easily identified. On the one hand, the most stable one of the Pitt Rivers Museum, with an annual average, highest and lowest amounts not showing great differences. On the other, the more seasonal one of the Diocesan and Regional Museum of Lleida, with months accounting for really high values, while the rest present a great difference and most of them are even below the annual average. Finally, the Benaki Museum presents a mixed model, with a high season and other with considerable amounts of visitors, but also some months with considerably lower values.

Table 122
Summary comparison table regarding patterns related to visitors amount during 2008

	Benaki Museum	**Diocesan and Regional Museum of Lleida**	**Pitt Rivers Museum**
Total amount	485,858*	71,182	725,305
Annual average	40,488*	5,932	60,442
% of annual average	75.3*	54.0	83.4
Month with the highest amount	April	April	May
Highest amount	53,763	10,984	72,447
Month with the lowest amount	August	August**	August
Lowest amount	25,279	3,729	48,293
% of lowest amount	47.0	34.0	66.7

Note: * Value obtained after correcting the missing values gap.
** Not taking into account the missing values. Otherwise, this month should be January.



Graph 10: Virtual visitors' amount pattern by institution during 2008.

Analysing the patterns of the unique IP addresses of the three institutions, the pattern shows some similarities, but also some differences with the one of the virtual visitors. In this case, also the Pitt Rivers Museum scores the highest amount of unique IP addresses and the Diocesan and Regional Museum of Lleida the lowest one. Once again, this last institution has a total amount of unique IP addresses that represent a tenth of the total amount of the Pitt Rivers Museum. This same pattern is identified when looking at the amount of the annual average. Looking at the percentage of this average in relation to the highest monthly amount, the Pitt Rivers Museum represents the highest value and the Diocesan and Regional Museum of Lleida the lowest one, but they decrease in five and four percentage points respectively. The Benaki Museum, however, increases this percentage slightly. The Diocesan and Regional Museum of Lleida is the only institution whose average value is lower than three fourths, since it scores merely 50.8 per cent. Regarding the month with the highest amount, the Benaki Museum presents its peak during March, April and May, the Diocesan and Regional Museum of Lleida during April and May and the Pitt Rivers Museum, conversely to the pattern of the total visitors, only during the month of September with a significant difference over the rest.

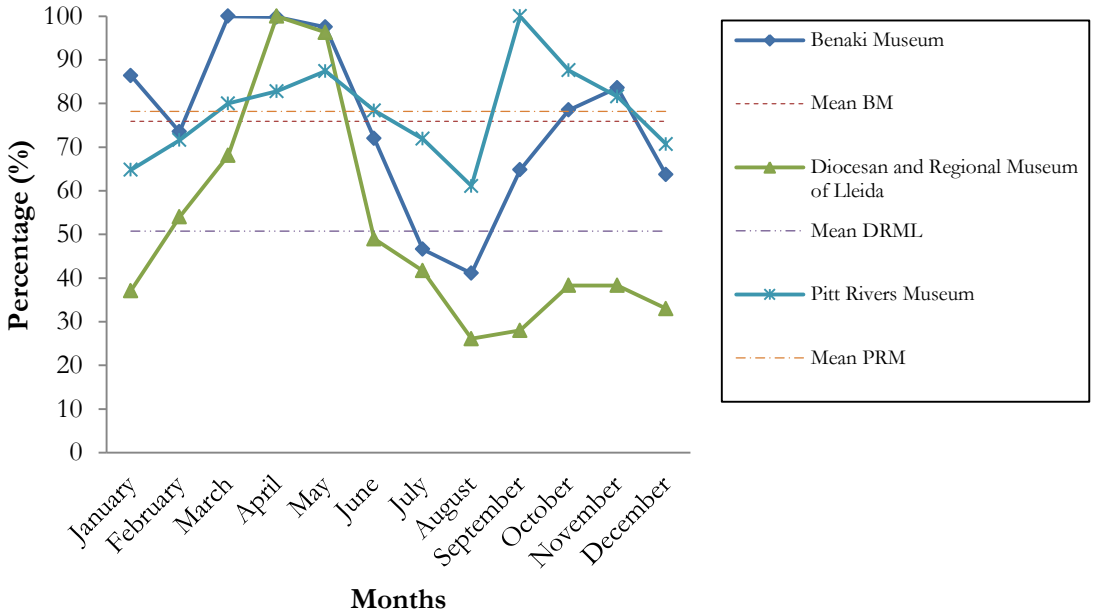
Also in this case, August represents the month with the lowest amount for the three institutions, with differences on the percentage regarding the highest amount. The Pitt Rivers Museum shows a value of 61.1, the Benaki Museum of 41.1 and the Diocesan and

Regional Museum of Lleida, finally, of 26.1 per cent. Analysing the unique IP addresses globally, the previous model is repeated with some differences. Values, in general, decrease in all the aspects, except for the annual average of the Benaki Museum that increases .3 percentage points. The Pitt Rivers Museum repeats the most regular model, but the difference between the peak and the rest of the months is more significant than in the previous case. On the other hand, the Diocesan and Regional Museum of Lleida presents two months with really high values, but eight below a percentage of fifty per cent. The Benaki Museum, finally, can be identified as a mixed model with a high season of unique IP addresses, but also two months below the percentage of a half.

Table 123
Summary comparison table regarding patterns related to unique IP addresses amount during 2008

	Benaki Museum	Diocesan and Regional Museum of Lleida	Pitt Rivers Museum
Total amount	352,772*	52,544	550,687
Annual average	29,398*	4,379	45,891
% of annual average	75.6*	50.8	78.2
Month with the highest amount	March	April	September
Highest amount	38,877	8,617	58,716
Month with the lowest amount	August	August	August
Lowest amount	15,972	2,246	35,877
% of lowest amount	41.1	26.1	61.1

Note: * Value obtained after correcting the missing values gap.



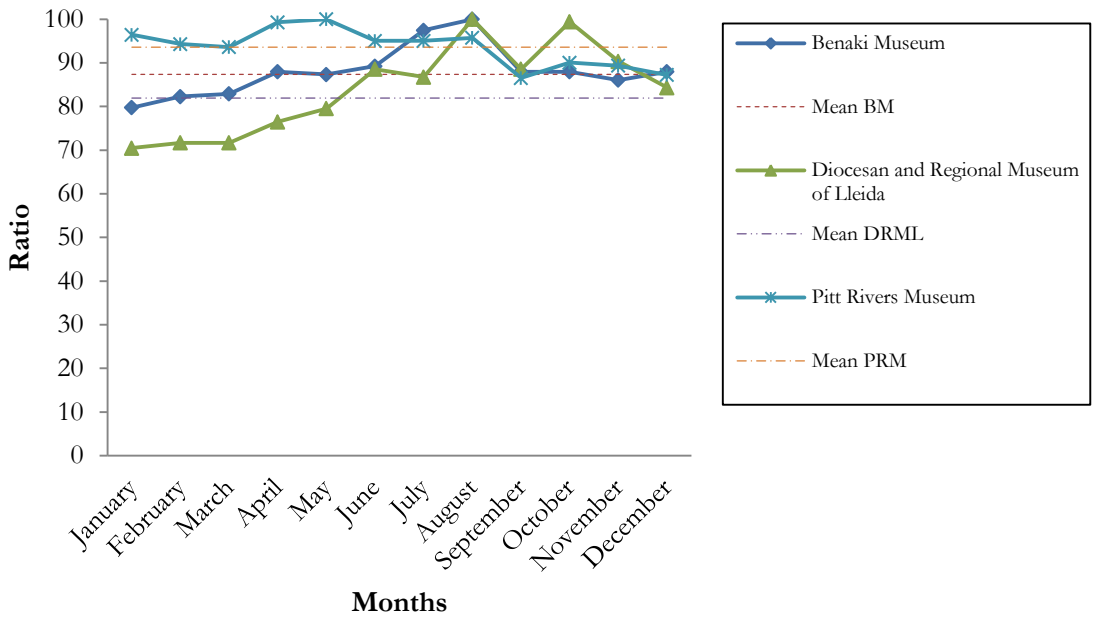
Graph 11: Unique IP addresses amount pattern by institution during 2008.

The ration of visitors per IP address is the feature showing the most stable models. However, there are significant differences with the previous features, because in this case the highest value is shown by the Benaki Museum (1.38) and the lowest one by the Pitt Rivers Museum (1.32). Although it represents the lowest value, the average of the Pitt Rivers Museum represents 93.6 per cent of the highest amount, whilst the ones of the Benaki Museum and the Diocesan and Regional Museum of Lleida are 87.3 and 81.9 per cent respectively. These last two institutions have their highest values during August, with a ratio of 1.58 for the Benaki Museum and 1.66 for the Diocesan and Regional Museum of Lleida. The highest amount of the Pitt Rivers Museum (1.41) takes place on May. Similarly to the months with the highest values, the Benaki Museum and the Diocesan and Regional Museum of Lleida present their lowest ratios (1.26 and 1.17 respectively) during January. These values represent respectively 79.8 and 70.5 of each institution. Once again, the Pitt Rivers Museum presents its lowest ratio (1.22) during September, representing 86.5 per cent of the highest value. Consequently, the three institutions show more stable models than with the previous features. Among them, moreover, the most stable one is the Pitt Rivers Museum with the highest ratios during April and May. The Benaki Museum shows the lowest ratios at the beginning of the year and the highest ones during July an August. The Diocesan and Regional Museum of Lleida also presents the lowest ratios at the beginning of the year, but its peaks are two separate months, namely August and October.

Table 124
Summary comparison table regarding patterns related to the ratio of visitors per IP address during 2008

	Benaki Museum	**Diocesan and Regional Museum of Lleida**	**Pitt Rivers Museum**
Annual average	1.38*	1.36	1.32
% of annual average	87.3	81.9	93.6
Month with the highest amount	August	August	May
Highest amount	1.58	1.66	1.41
Month with the lowest amount	January	January	September
Lowest amount	1.26	1.17	1.22
% of lowest amount	79.8	70.5	86.5

Note: * Value obtained after correcting the missing values gap.



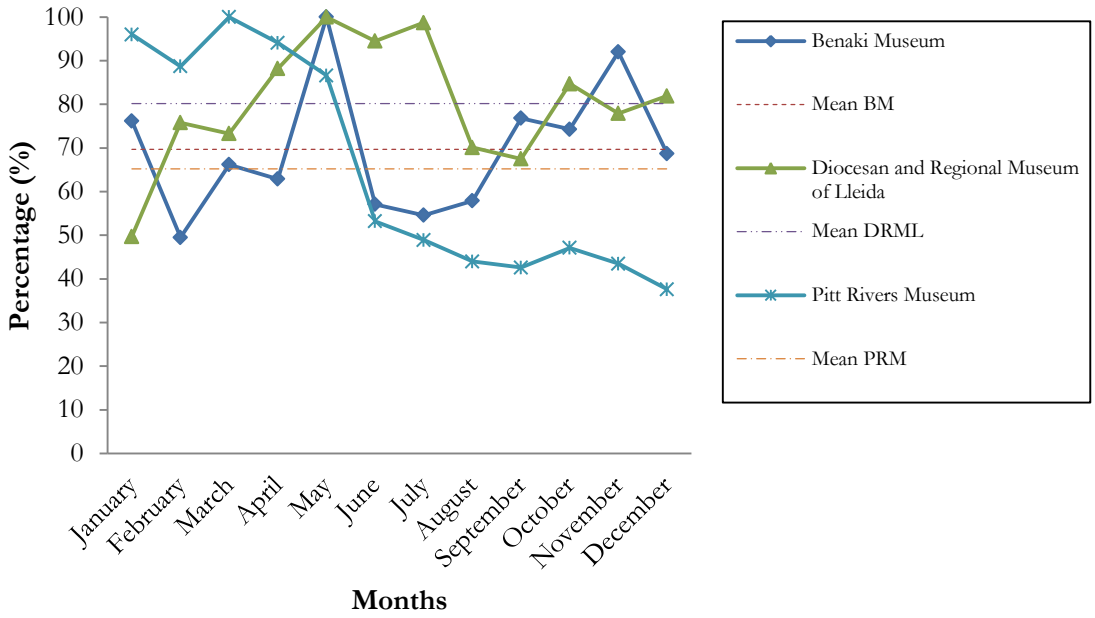
Graph 12: Ratio of visitors per IP address pattern by institution during 2008.

Looking at the pattern of amount of pages viewed, the models are considerably different with regards to the previous ones. In total terms, the Benaki Museum is the institution with the highest amount of pages viewed, while the Diocesan and Regional Museum of Lleida is the one with the lowest amount. This same pattern is observed with the annual average absolute values, but, taking a look at the percentages regarding the highest value, the Diocesan and Regional Museum of Lleida gets the first place with 80.2. The Benaki Museum and the Pitt Rivers Museum, on the other hand, present percentages of 69.7 and 65.2 respectively. May is the month with the highest amount for both the Benaki Museum and the Diocesan and Regional Museum of Lleida, while this maximum is scored on March by the Pitt Rivers Museum. Regarding the months with the lowest amount, the Benaki Museum has it on February, representing 49.5 of the highest one. Similar percentage is scored by the Diocesan and Regional Museum of Lleida (49.7), but during the month of January. Conversely to what happens with all the previous features, the Pitt Rivers Museum is the institution with the lowest percentage of pages viewed. In fact, during December, 88,666 pages have been viewed, representing 37.6 per cent of the highest amount. Looking at the global model, the Pitt Rivers Museum presents a clearly decreasing model, because, although the first five months present percentages at least around 90.0 per cent, the rest of the months decrease considerably, with only June scoring a percentage over a half (53.2). The Diocesan and Regional Museum of Lleida, on the contrary, show a high season during the months of April, May, June and July and the lowest one on January, while the rest of

the months score values between 67.5 and 84.7. Finally, the Benaki Museum is the institution with the most irregular model, because some of the months with some of the highest values (January, May and November) are followed by others with significantly lower ones (February, June and December). Consequently, these highs and lows made the Benaki Museum the institution with the most irregular model in terms of pages viewed.

Table 125
Summary comparison table regarding patterns related to pages viewed amount during 2008

	Benaki Museum	Diocesan and Regional Museum of Lleida	Pitt Rivers Museum
Total amount	4,979,011	313,433	1,843,517
Annual average	414,918	26,119	153,626
% of annual average	69.7	80.2	65.2
Month with the highest amount	May	May	March
Highest amount	595,403	32,572	235,624
Month with the lowest amount	February	January	December
Lowest amount	294,732	16,183	88,666
% of lowest amount	49.5	49.7	37.6



Graph 13: Pages viewed amount pattern by institution during 2008.

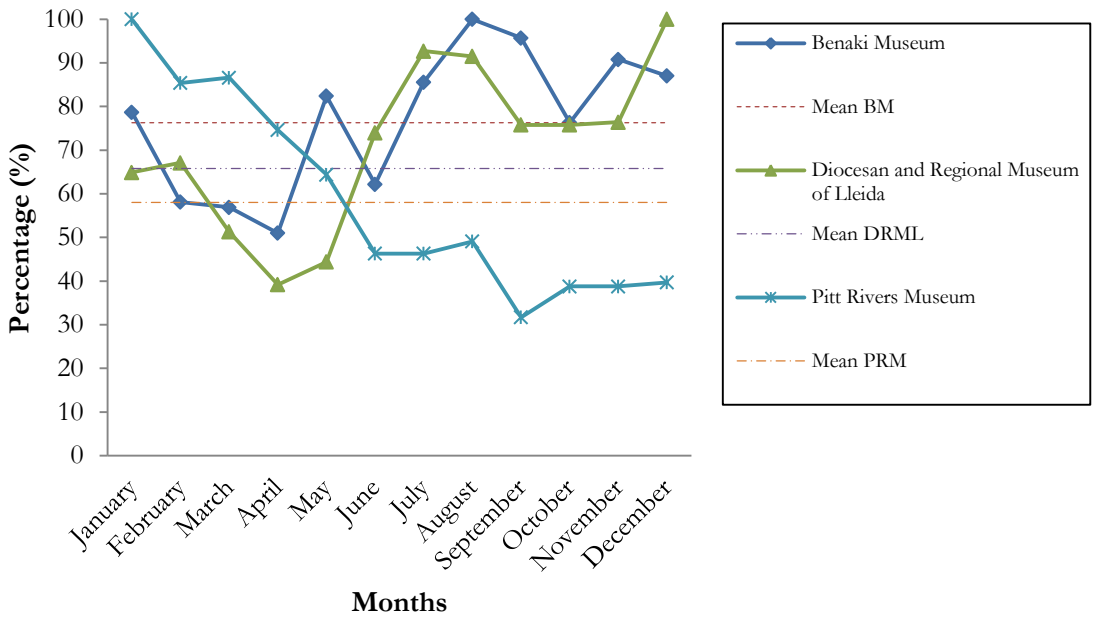
The pattern concerning the number of pages per visitor each month shows similar models than the ones of the total pages viewed, but with substantial differences. The most evident one is that, while the annual average value for this measurement is the highest in the case of the Benaki Museum (10.25), the Pitt Rivers Museum presents the lowest amount of pages per visitor (2.54). The Diocesan and Regional Museum of Lleida scores an annual average of 4.40 pages per visitor. The percentage of the annual average in comparison to

the highest amount of the year follows the same pattern, because the Benaki Museum scores 75.2 per cent, the Diocesan and Regional Museum of Lleida 65.8 and the Pitt Rivers Museum 58.0. Regarding the month with the highest amount, the Benaki Museum displays a value of 13.64 pages per visitor during August. The Diocesan and Regional Museum of Lleida, on the other hand, scores its maximum (6.69) on December, whilst, finally, January is the month with the highest amount of pages per visitor in the Pitt Rivers Museum with 4.38. When looking at the months with the lowest amount of pages per visitor, April represents this month in both the Benaki Museum (6.69) and the Diocesan and Regional Museum of Lleida (2.62). In the first case, it represents 49.1 per cent of the highest amount and in the latter one 39.2. In the case of the Pitt Rivers Museum, however, the month with the lowest amount of pages per visitor is 1.39 and takes place during September. This institution shows a decreasing model with the four first months over 70.0, while the rest decrease to reach the bottom of the model on September. The Diocesan and Regional Museum of Lleida shows again a high season during July and August, but the highest peak is reached in December. As happens with the amount of pages, the Benaki Museum shows a highly irregular model with peaks and lows, but also the one with the smallest differences among them.

Table 126
Summary comparison table regarding patterns related to the ratio of pages viewed per visitor during 2008

	Benaki Museum	**Diocesan and Regional Museum of Lleida**	**Pitt Rivers Museum**
Annual average	10.25*	4.40	2.54
% of annual average	75.2	65.8	58.0
Month with the highest amount	August	December	January
Highest amount	13.64	6.69	4.38
Month with the lowest amount	April	April	September
Lowest amount	6.69	2.62	1.39
% of lowest amount	49.1	39.2	31.7

Note: * Value obtained after correcting the missing values gap.



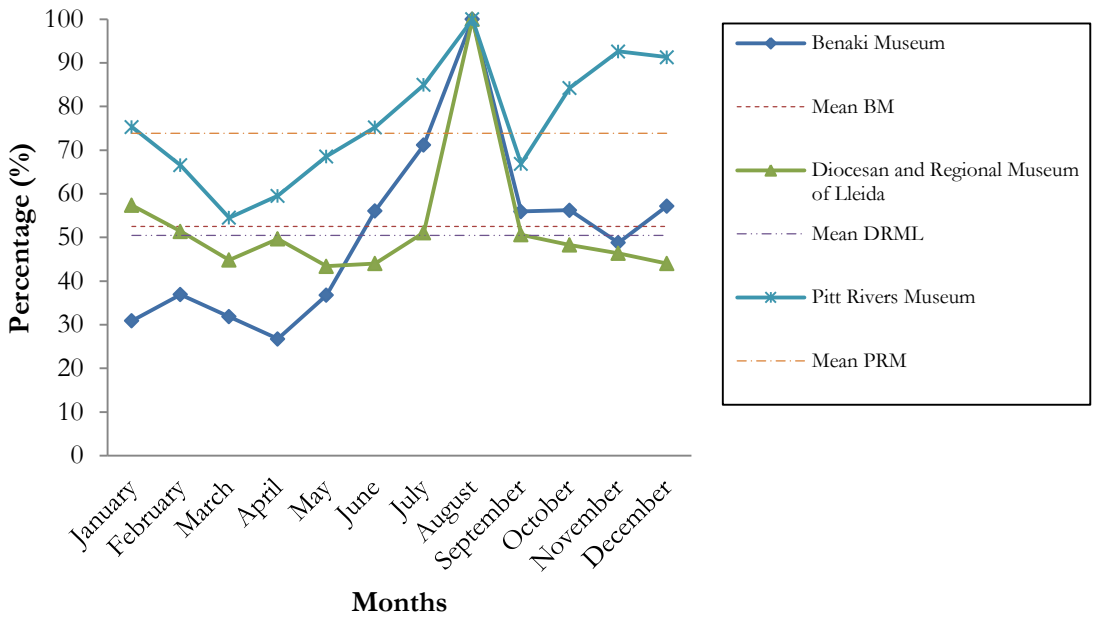
Graph 14: Pages viewed per visitor pattern by institution during 2008.

Finally, regarding the duration of the visits, the Pitt Rivers Museum obtains the first place in terms of seconds spent on the website with a total of 164,022,649 and the Diocesan and Regional Museum of Lleida drops to the last one with a total of 22,894,740 second spent on the website. Analysing the mean duration of the visits, anyhow, this pattern is not reproduced again, because the Pitt Rivers Museum presents the shortest average duration of visits with 221 seconds, while the Benaki Museum gets the top place with a mean duration of 331 seconds. The relation of these values to the highest one of the year, however, inverses the pattern again to the one of the total amount of seconds spent on the website, because the mean duration of the visits of the Pitt Rivers Museum represents 79.1 of the highest amount of the year. The average duration of the Benaki Museum and the Diocesan and Regional Museum of Lleida, conversely, score 52.5 and 50.5 per cent respectively. When dealing with the longest duration of visits, the three institutions score these values during the month of August, but with a significant difference, since the values of the Benaki Museum and the Diocesan and Regional Museum of Lleida (631 and 638 respectively) double the one of the Pitt Rivers Museum (299). This fact explains that, even having a similar amount (169 for the Greek museum and 163 for the British one), the percentages of the Benaki Museum (26.8) and the Pitt Rivers Museum (54.5) follow the contrary pattern. The Diocesan and Regional Museum of Lleida, with 277 seconds that represent 43.4 per cent of the maximum, is in the mid-way between these two extreme models. Anyhow, all these values are scored during the first months of the year, because

the Benaki Museum presents it on April, the Diocesan and Regional Museum of Lleida on May and the Pitt Rivers Museum on March. Looking at the global models, three different ones can be identified. Firstly, the Diocesan and Regional Museum of Lleida presents a regular model, with all the months ranging from a minimum of 43.0 per cent to a maximum below 60.0, except for August, where a peak with a considerable difference is reached. On the other hand, the Benaki Museum presents the model with the highest differences. The first five months of the year score values below 40.0, but then these values begin to increase gradually to reach the peak on August. After this peak, the values of the months drop below 60.0 but maintain a constant around 50.0. Finally, the Pitt Rivers Museum shows a similar model, but with some significant differences. January stays over the annual mean, but the next two months drop considerably to reach the bottom of the year. Nevertheless, from March on, values increase gradually until August marks the peak duration of visit. Similarly to the Benaki Museum, the value of September drops even below the annual mean, but the remaining three months present three of the five longest durations of visit. Consequently, these three models can be described as follows. The Diocesan and Regional Museum of Lleida shows a regular stable model with a peak on August. The model of the Benaki Museum can be described as an increasing and later decreasing one with a peak on August. Lastly, the Pitt Rivers Museum presents a model with a bottom on the early year and then an increase to reach the peak on August, but after a month below the mean annual duration, another season of really long duration of visits.

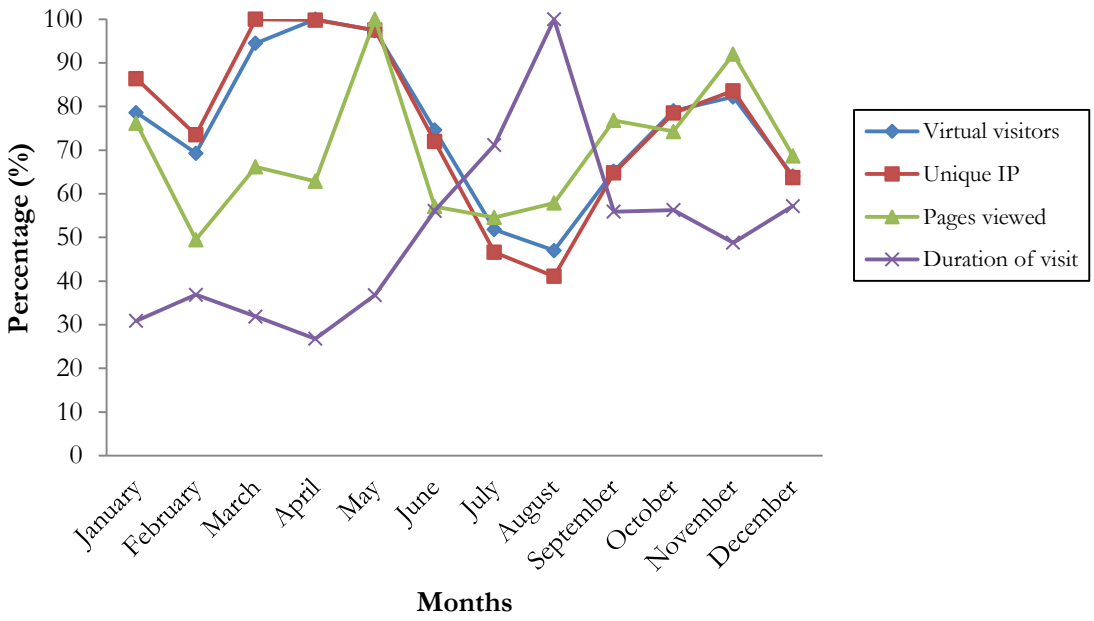
Table 127
Summary comparison table regarding patterns related to duration of visit during 2008

	Benaki Museum	**Diocesan and Regional Museum of Lleida**	**Pitt Rivers Museum**
Total seconds	149,013,316	22,894,740	164,022,649
Annual average	331	322	221
% of annual average	52.5	50.5	73.9
Month with the longest duration	August	August	August
Longest duration in seconds	631	638	299
Month with the shortest duration	April	May	March
Shortest duration in seconds	169	277	163
% of shortest duration	26.8	43.4	54.5



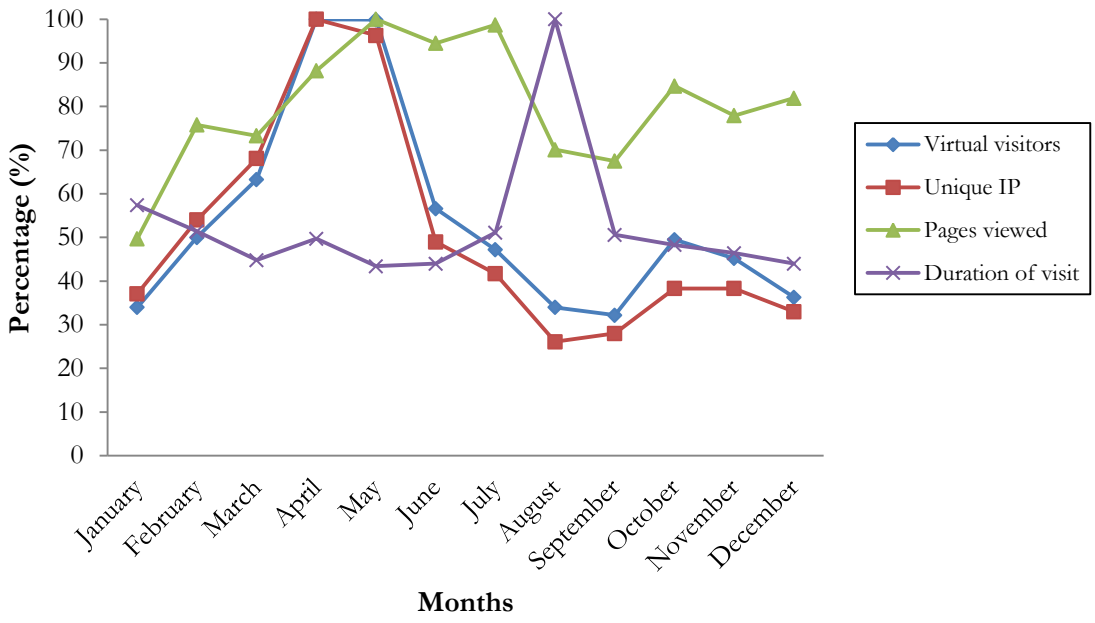
Graph 15: Duration of visit pattern by institution during 2008.

Taking into account all these features together, there are some overall similarities and differences of use of the websites of the three institutions. First of all, however, the global model of each institution has to be examined separately. The Benaki Museum, as well as the other institutions, presents a close relation between the virtual visitors and the unique IP addresses. Therefore, only the amount of visitors will be described here. Regarding the amount of visitors, the Benaki Museum presents two high seasons, separated by the months with some of the lowest amounts of the year. The duration of the visits, conversely, presents the completely opposite pattern, with only a peak during August and shorter durations during the rest of the year. The pages viewed do not show a regular pattern, but different highs and lows during the whole year. Moreover, although the highest amount of pages viewed coincides with one month of high amount of visitors, the lowest one does not coincide with any month with significantly low amounts of visitors. Besides, one of the lowest amounts of pages viewed coincides with the longest mean duration month. So, in this case, no clear relation can be inferred from the amount of pages viewed in relation to any other feature.



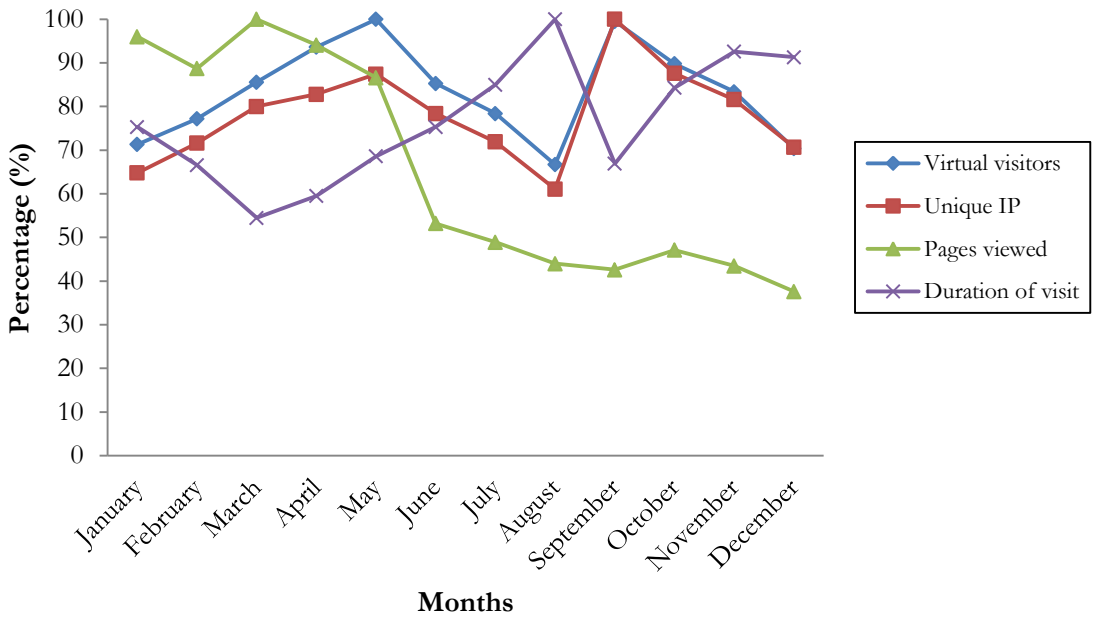
Graph 16: Global model of use of the Benaki Museum website during 2008.

Looking at the Diocesan and Regional Museum of Lleida, the model shows some significant differences. First of all, the amount of visitors shows a more stationary pattern, with two months scoring high values, while the rest are considerably below. Regarding the mean duration of visits, it also shows an inverse correlation with the amount of visitors, except for the last months of the year when lower amounts of visitors coincide with average values of duration of visit. However, the longest duration of visits coincides with one of the lowest amounts of visitors. Analysing the amounts of pages viewed per month, the Diocesan and Regional Museum of Lleida presents a more stable model than the Benaki Museum, with a season of high amounts. Also in this case, no direct relation can be inferred related to amount of pages viewed and the other features, since the highest amount coincides with one of the highest amounts of visitors, but the other two highest ones with average values of both visitors and duration of visit.



Graph 17: Global model of use of the Diocesan and Regional Museum of Lleida website during 2008.

Finally, the Pitt Rivers Museum shows a completely different model with two different high seasons both in terms of amount of virtual visitors as well as duration of visit. This case also presents a clear inverse correlation between duration of visits and amount of visitors with peaks and lower values coinciding on the same months. As mentioned before, there are two seasons of high values in these features, giving a more season irregular character to the amount of visitors and duration of visits. This two peaks model might be linked to the research and academic character of the museum, with more numerous visitors during May and September. Similarly, also the number of pages viewed shows a completely different model, because it has an initial high season followed by a general decreasing pattern from the second part of the year on.



Graph 18: Global model of use of the Pitt Rivers Museum website during 2008.

Summing up, the three selected institutions present different models of use of the website by users taken as a global homogeneous entity. One of the main general findings is that there is a general inverse correlation between the amount of virtual visitors and the duration of the visits. The three institutions have their longest duration of visits during August, but while the Benaki Museum and the Diocesan and Regional Museum of Lleida show considerably shorter duration on the rest of the months, the Pitt Rivers Museum has another high season at the end of the year. This institution, on the other hand, presents the most different pattern of pages viewed, since, while the other two museums present highs and lows, it has a high season at the beginning of the year to decrease gradually afterwards. If the amount of virtual visitors is analysed, the Benaki Museum and the Diocesan and Regional Museum of Lleida show a clearer seasonal use, while the peaks of the Pitt Rivers Museum are related to specific months traditionally linked with some concrete facts of the academic and research ambit. Being it so, these models can be labelled as follows. The model of the Benaki Museum shows a bi-seasonal concentration of visitors, an irregular pattern of pages view and, besides the summer peak, a concentration of longer visits at the end of the year. The Diocesan and Regional Museum of Lleida, conversely, shows a single seasonal higher amount of visitors, a seasonal concentration of pages viewed and, apart from the considerably longer peak, more regular mean durations of the visits. Finally, the Pitt Rivers Museum is represented by a more specific month related peaks of visitors, a clearly seasonal pages viewed amount and a more regular two seasonal period of longer

duration of visits. Consequently, these three institutions present different models of global usage of their websites.

4.2.2.- Museums weblog analysis: the Pitt Rivers Museum whole website

As has been mentioned before, another objective of the research is to identify differences on the global use of diverse resources on the websites. In this case, due to data availability, the selected institution has been the Pitt Rivers Museum and its three different website sections. These three resources of the website of the museum are the main site, the different sections of the projects and the databases of objects and photographs. These resources will be analysed comparing their patterns of usage in terms of number of visitors, unique IP addresses, number of pages viewed and duration of visits mainly. In the case of the databases section, these last two features are not analysed as the previous ones because of the structure of the data. According to these data, the seconds spent on the database have been identified by IP address and not by visit and time frame. Similarly, neither the number of pages viewed can be exactly measured. An exploratory approach to this feature has been carried out summing the amount of accesses, searches, direct searches and navigation between records. Anyway, the results obtained are estimations made from the data and do not necessarily coincide with the real amounts. Additionally, data from the database of the Pitt Rivers Museum shows another peculiarity. As the ultimate aim of these data was not to analyse the global behaviour on the resource, but the individual one, and due to its more academic research-oriented character, obtained data do not correspond with the natural year. Answering also to the needs and resources of the staff from the Pitt Rivers Museum, the data provided relates to the academic year 2007-2008. In fact, although the other two resources present values from 2008, data regarding the use of the database begins on October 2007 and finishes on October 2008. However, as the aim of this section is to compare patterns along the year, these data has been treated as a unique year[81].

All the analysed resources are different between them. In the case of the section of the projects of the Pitt Rivers Museum, it deals with six different subsidiary sites about specific topics. The analysed sites are the following ones:

[81] Consequently, October will be a sum of the entries of this month during 2007 and 2008, November and December of merely 2007 and the rest of the months of 2008.

- *Arms and armour virtual gallery*. A compilation of about 12,000 arms and armours related objects from the Pitt Rivers Museum, accessible for searches and also for browses across thematic groupings and selected highlights. It started on June 2008.
- *English artefacts in the Pitt Rivers Museum*. A compilation of artefacts, photographs and manuscripts from England present at the Pitt Rivers Museum. This subsidiary site was launched on March 2008.
- *Luo visual history*. This site presents a compilation of around 350 historical photographs of the Luo community in Western Kenya, which can be browsed by different ways. This site was made available for the general audience on April 2008.
- *Recovering the material and visual cultures of Southern Sudan*. It provides a complete catalogue of more than 1,300 artefacts and 5,000 photographs from Southern Sudan held at the Pitt Rivers Museum. This site was already available before 2008.
- *The Relational Museum*. This site presents information about the history of the Pitt Rivers Museum from its foundation to the current days. It also shows statistics on the origin of the objects, the type of objects contained by the institution and information on the contributors to the Pitt Rivers Museum, among others. It was already working by the beginning of 2008.
- *Tibet Album*. A compilation of more than 6,000 photographs on the history and ways British visitors encountered the Tibet and its peoples. Photographs are browsable on different ways. This site was running before 2008.

A brief individual overview on the pattern of each project will be initially provided, but, for the comparison with both the main section, as well as with the database, data from the different projects will be harmonized and treated more globally.

4.2.2.1.- Brief overview on the general site's patterns

As seen on the previous analysis, the general site of the Pitt Rivers Museum shows a very specific model of global use by the virtual visitors. In terms of total visitors amount it presents two clear peaks during May and September, while January, August and December are the months with the lowest values. This gives to the model a shape of continuous increases and decreases. The relation of the amount with the duration of visits, on the other hand, shows an inverse correlation, with some of the longest mean durations coinciding with the lowest amount of visitors. Thus, the longest mean duration is recorded on August. Looking at the amount of pages viewed, conversely, the model is completely

different, because there is a clear seasonal pattern, with the highest values during the first five months of the year and a significant decrease during the rest of the months. Consequently, as identified by the model presented on the previous section[82], the main site of the Pitt Rivers Museum shows specific month-related peaks of visitors and duration of visits, but a clearly seasonal pattern of pages viewed.

4.2.2.2.- Projects subsidiary sites' patterns: Individual analysis

Before analysing the global pattern of the project resources, the research is going to briefly identify and delimit the individual features of each one of them. Afterwards, subsidiary sites of the projects will be treated as two global groups in order to be able to compare the main site of the Pitt Rivers Museum with them. The first difference between the projects is the starting date of the provided information, because some of them were made available for the general audience during 2008. In fact, *Recovering the material and visual cultures of Southern Sudan, The Relational Museum* and *Tibet Album* are the only resources available before January 2008, while *English artefacts in the Pitt Rivers Museum*, *Luo visual history* and *Arms and armour virtual gallery* were accessible on the website from March, April and June respectively. The subsequent groups of the subsidiary websites will be created taking into account this peculiarity. Taking this difference into account, projects will be analysed individually comparing them with the other projects of each group. The comparison is done this way, because the pattern of a recently accessible project may logically differ from a long established one[83].

Regarding the number of visitors, the total amount differs quite significantly. The *Tibet Album* is the site with the highest amount, scoring 131,664 visits, while *Recovering the material and visual cultures of Southern Sudan* has received 108,221 ones. From the project already available before 2008, the *Relational Museum* is the one with the lowest amount, with 26,325 visits. Although it was launched on June 2008, the *Arms and armour virtual gallery* project site presents an amount of 25,588 visits, which nearly reaches the amount of the *Relational Museum* in only seven months. The *English artefacts in the Pitt Rivers Museum* site, similarly, scores a total of 21,955 visits in ten months. Finally, the *Luo visual history* site presents the lowest amount of visitors with only 3,186 during nine months.

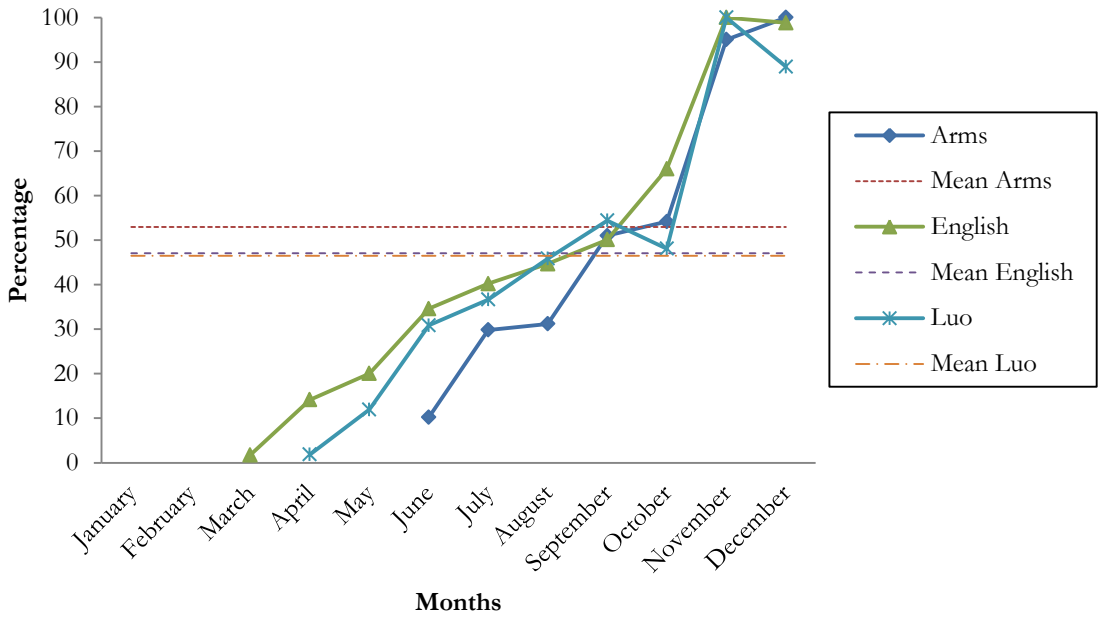
[82] See graph 18.
[83] The results will also be shown graphically differentiating these two groups for an easier understanding.

Looking at the pattern of visitors, the projects already available before 2008 present irregular models with higher and lower seasons. The *Relational Museum* site has its peak during the month of January and then decreases significantly to score 73.3 per cent during the month of February, which is the second one in number of visitors. Apart from June (58.6), after a period of months with lower amounts than the mean (56.1), October (72.6) and November (66.7) increase the number of visitors considerably, but then again it drops during December below the mean (43.9). *Recovering the material and visual cultures of Southern Sudan*, on the other hand, presents a high season during the first four months of the year, with values above 90.0 per cent in all the cases. In fact, the highest amount of visitors is reached in April. On May, conversely, it scores the lowest amount of visitors (56.4), but is followed by a slight peak during June (77.5), which represents the highest value among the months below the annual mean (81.0). From October on, *Recovering the material and visual cultures of Southern Sudan* presents a second season with values above the mean, but in this case the highest one of them is reached by November (88.8) with an amount below 90 per cent of the highest one. Finally, among the projects available on the website of the Pitt Rivers Museum before 2008, the *Tibet Album* presents a different model, because January (55.3) and February (58.8) are among the months with the lowest amount of visitors, followed by March, which represents the highest peak of the whole year. Once again, May represents one of the lowest amount of visitors (59.0) and June (77.1) represents another peak over the annual mean (68.5). August, September and October are quite stable in terms of visits with a 58.4, 57.6 and 59.6 respectively, but followed by November (81.5) that represents the third month in terms of total visitors. Therefore, this model presents clearer highs and lows on this aspect.

Graph 19: Visitors pattern on the subsidiary sites available before 2008 on the website of the Pitt Rivers Museum.

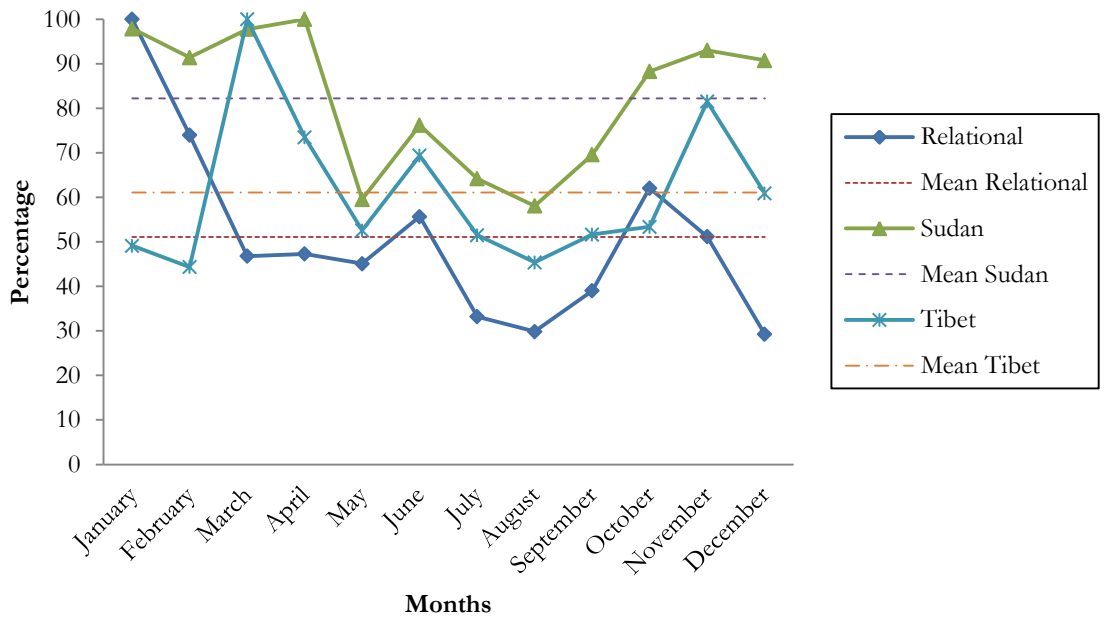
Analysing this pattern on the subsidiary sites made available during 2008, there is an increasing pattern common to all of them, but with slight differences. First of all, the *Arms and armour virtual gallery* project is the only one that starts with a significant proportion of visitors, because during June, the starting month, it presents a relative value of 10.2. July and August present values around thirty per cent and September and October above half. Finally, November (95.0) and December (100.0) present the highest amounts of visitors. Thus, the *Arms and armour virtual gallery* project presents a gradually increasing model with stable periods of two months after the starting one. The *English artefacts in the Pitt Rivers Museum* site, on the other hand, presents a more linear gradually increasing model until October (66.0). After this month, values increase significantly and reach the highest amount during November to slightly decrease during December (98.8). Therefore, the model of the *English artefacts in the Pitt Rivers Museum* site is more linear and gradual, although the increase in the amount of visitors is more drastic after October. Finally, *Luo visual history* project presents a gradually increasing model but with two peculiarities on October and December. After a gradual increase until September (54.4), the value of October drops (48.1) even though it remains above the annual mean (46.5). The annual peak is reached during November, but then again the amount of visitors drops to 89.0 per cent during December. So, although the general pattern is an increasing one, the *Luo visual*

history site presents some decreases in the amount of visitors on the months of October and November. Nevertheless, the three projects present a general increasing model.



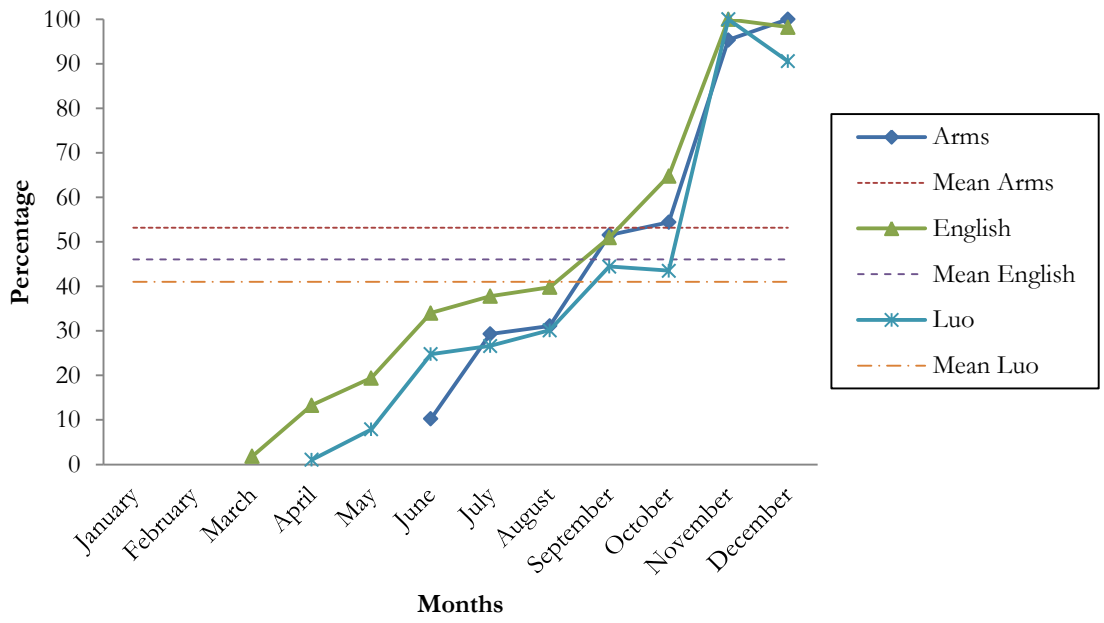
Graph 20: Visitors pattern on the subsidiary sites available during 2008 on the website of the Pitt Rivers Museum.

When the analysed feature is the amount of unique IP addresses, the pattern are exactly the same as the ones regarding the total amount of visitors. The *Relational Museum* project shows again a model with the highest peak at the beginning of the year and another one during October and November. Among the rest of the months, only June scores above the annual mean. The *Recovering the material and visual cultures of Southern Sudan* project also presents the two high seasons model, with the highest values at the beginning and the end of the year. June is again, apart from the high seasons, the month with the highest value. The *Tibet Album*, finally, presents the three peaks model, with only March, April, June and November over the annual mean.



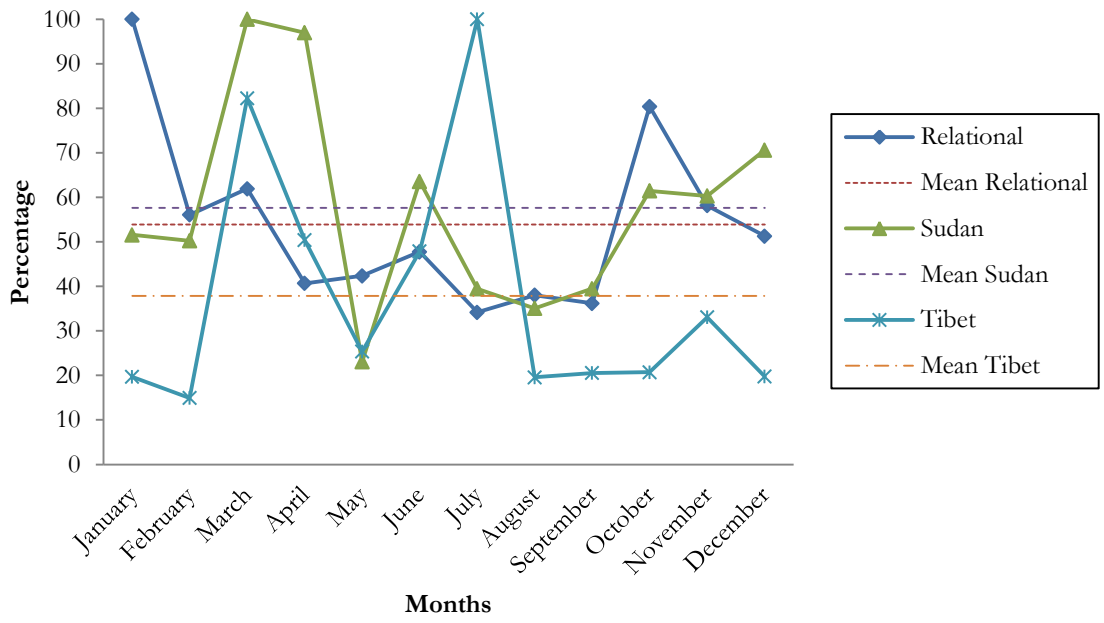
Graph 21: Unique IP addresses pattern on the subsidiary sites available before 2008 on the website of the Pitt Rivers Museum.

Similarly, analysing the projects that began on 2008, the model about the unique IP addresses follows the same patterns as the ones of the total visitors. The project about *Arms and armour virtual gallery* shows the gradually increasing model by stages. The *English artefacts in the Pitt Rivers Museum* one presents the gradually increasing model with the significant increase on November and the slight drop on December. Finally, the *Luo visual history* site shows a general increasing model with October and December not following the general pattern, but decreasing with respect to the previous month.



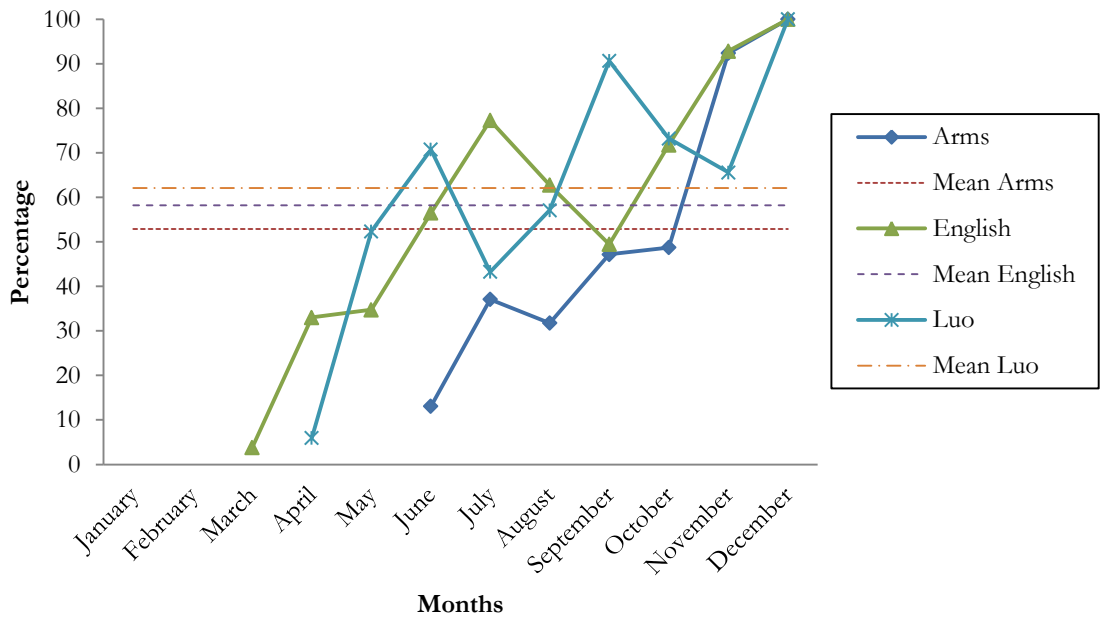
Graph 22: Unique IP addresses pattern on the subsidiary sites available during 2008 on the website of the Pitt Rivers Museum.

Looking at the pattern of pages viewed per month, the patterns show a clearly irregular pattern. Analysing the *Relational Museum* site, the peaks are related to the months of January (100.0) and October (72.6). Only February (56.1), March (61.9) and November (59.1) are above the annual mean (53.9). The rest of the months are below the mean. On the *Recovering the material and visual cultures of Southern Sudan* subsidiary site, the months with the highest values are March (100.0) and April (97.0), followed by the lowest amount on May (23.1). June (63.6) is above the annual mean (57.7), but then the amount drops below the mean until October (61.5). November (60.3) and December (70.6) are the other months above the mean. So, even though it shows an irregular model, *Recovering the material and visual cultures of Southern Sudan* has more seasonal peaks. Finally, the *Tibet Album* shows the most irregular model with two high peaks on March (82.3) and July (100.0), April (50.4) and June (47.9) above the annual mean (37.9), but the rest of the months around twenty per cent, except for May (25.4) and November (33.1).



Graph 23: Pages viewed pattern on the subsidiary sites available before 2008 on the website of the Pitt Rivers Museum.

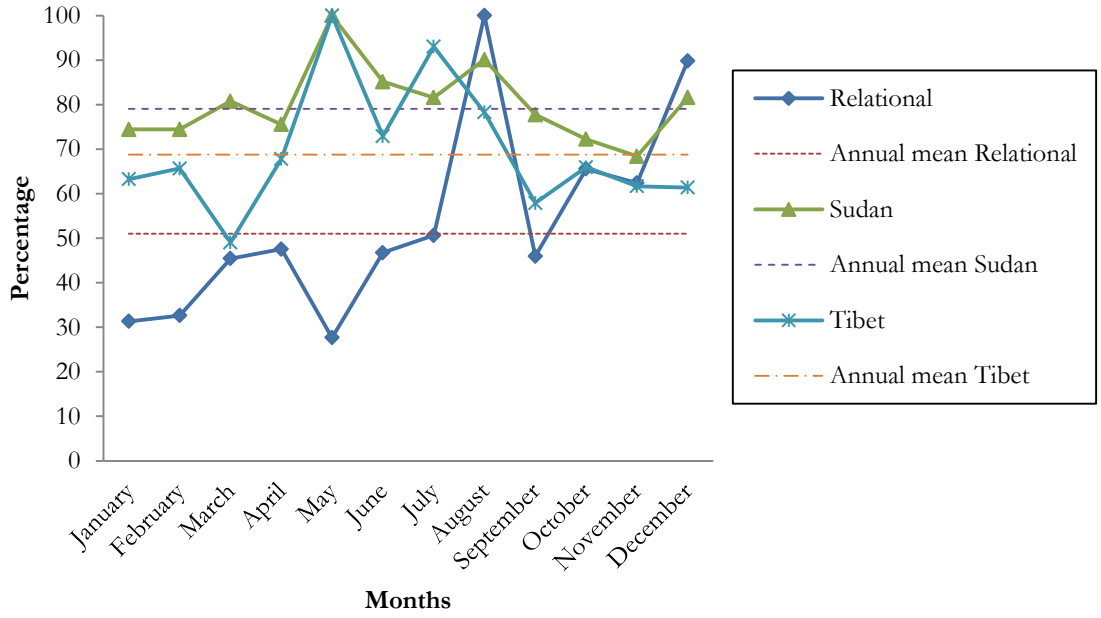
Taking a closer look at the projects starting during 2008, the irregularity also takes place among them. The *Arms and armour virtual gallery* project shows the most regular increasing model, because only August (31.8) shows a value lower than the one of July, the previous month (37.1). From October (48.7) to November (92.4), the values almost double and only November and December (100.0) are above the annual mean (52.9). The site of the *English artefacts in the Pitt Rivers Museum* project shows a two peak model, with July (77.3), August (62.7), October (71.8), November (92.8) and December (100.0) above the annual mean (58.2). Finally, the *Luo visual history* shows a highs and lows model, because after June (70.7) and September (90.7) percentages drop (July 43.3 and October 73.2) and reaches the top amount during December. In fact, only June, September, October, November (65.6) and December are above the annual mean (62.1). Consequently, even though all the sites reach the highest amount on December, they present an irregular increasing model.



Graph 24: Pages viewed pattern on the subsidiary sites first available during 2008 on the website of the Pitt Rivers Museum.

The last feature to be analysed is the duration of visits. In total terms, the *Tibet Album* is the project with the highest amount of seconds, representing a total of 2,814,436, followed by *Recovering the material and visual cultures of Southern Sudan* with 2,395,439 seconds. Surprisingly, the *Arms and armour virtual gallery* site is the next project with a total of 499,154 seconds, while the *Relational museum* scores 428,620. The next project is the *English artefacts in the Pitt Rivers Museum* with a total amount of 358,456 seconds and the *Luo visual history* gets the last place with 152,379. Looking at the annual mean duration of the visits, however, the *Luo visual history* gets the top place with 430 seconds per visit, followed by *Recovering the material and visual cultures of Southern Sudan* (288), the *Tibet Album* (257) and the *Relational museum* (195). The *English artefacts in the Pitt Rivers Museum* (163) and *Arms and armour virtual gallery* (137) are the sites of the projects with the shortest mean annual duration of visits. Analysing the pattern of each individual project available before 2008, the *Relational museum* presents an irregular model with very significant differences, because between the two months with the longest duration (August 383 seconds and December 344 seconds) and the rest of the months the difference is of around 100 seconds at least. In fact, October (251 seconds and 65.5 per cent) and November (239 seconds and 62.4) are the only months above the annual mean (51.0). The months with the shortest durations are January (120 seconds and 31.3), February (125 seconds and 32.6) and May (106 seconds and 27.7). *Recovering the material and visual cultures of Southern Sudan* is the site with the most constant

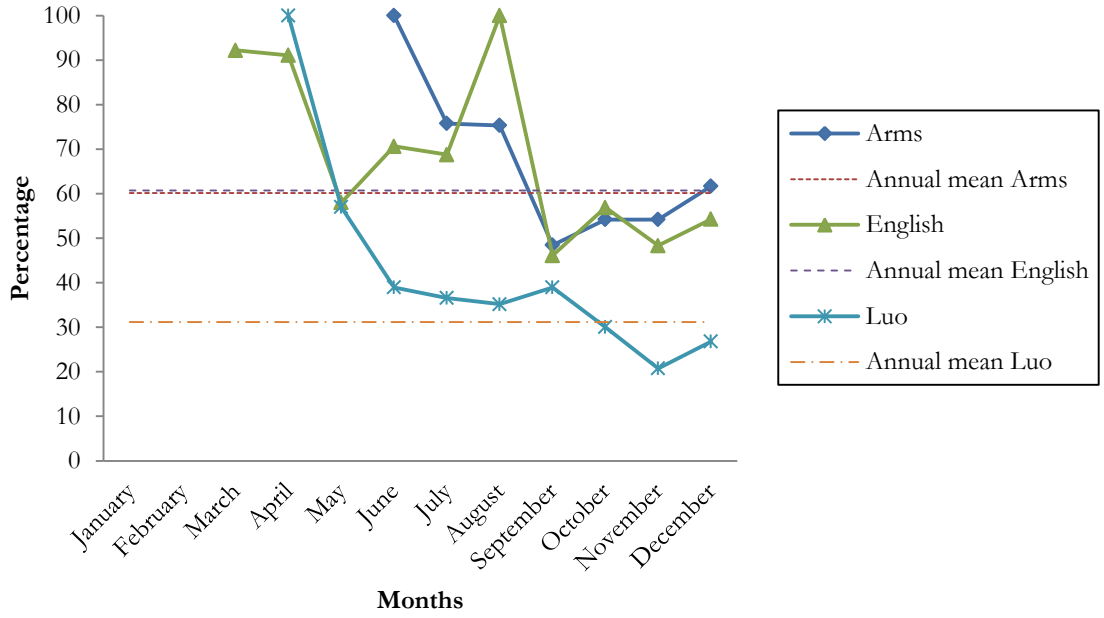
model, because, between the month with the longest duration (May 361 seconds) and the one with the shortest (November 249 seconds and 68.4 per cent), the difference is of around a third. Apart from May, June (310 seconds and 85.2), July (297 second and 81.6), August (328 and 90.1) and December (297 and 81.6) are the months with the highest values. October (263 seconds and 72.3), January and February (271 seconds and 74.5 both) are the other months with the shortest durations. Regarding the *Tibet Album*, it shows a high season with two peaks on May (373 seconds) and July (347 seconds and 93.0). The shortest durations, on the other hand, are March (183 seconds and 49.1) and September (216 seconds and 57.9). Once again, the irregularity is common to all these three models.



Graph 25: Duration of visits pattern on the subsidiary sites available before 2008 on the website of the Pitt Rivers Museum.

Analysing the projects that started during 2008, *Arms and armour virtual gallery* shows a general decreasing model with a final slight increase in the duration of the visits. June marks the month with the longest duration (227 seconds) and it decreases until it reaches the shortest duration during September (110 seconds and 48.5 per cent). Afterwards, it increases gradually to reach 140 seconds and 61.7 per cent in December. The site of the *English artefacts in the Pitt Rivers Museum* project, on the other hand, shows the most irregular one among the ones starting on 2008, because, although it shows some of the highest values on March (248 seconds and 92.2) and April (245 seconds and 91.1), it also presents the highest peak during August (269 seconds). After that, September scores the shortest

value with 124 seconds and 46.1 per cent, followed by November (130 seconds and 48.3) and December (146 seconds and 34.3). Finally, the *Luo visual history* site presents the most clearly decreasing model, with 1382 seconds in April and 787 and 57.0 per cent in May. Then it decreases gradually every month, except for September (538 seconds and 39.0) and December (370 seconds and 26.8), which increase the values comparing to their previous month. Actually, the month with the shortest duration is November with 287 seconds that represents 20.8 per cent of the amount of April. Thus, except for the more irregular *English artefacts in the Pitt Rivers Museum* site, the other two present a generally decreasing model in terms of visits duration.



Graph 26: Duration of visits pattern on the subsidiary sites first available during 2008 on the website of the Pitt Rivers Museum.

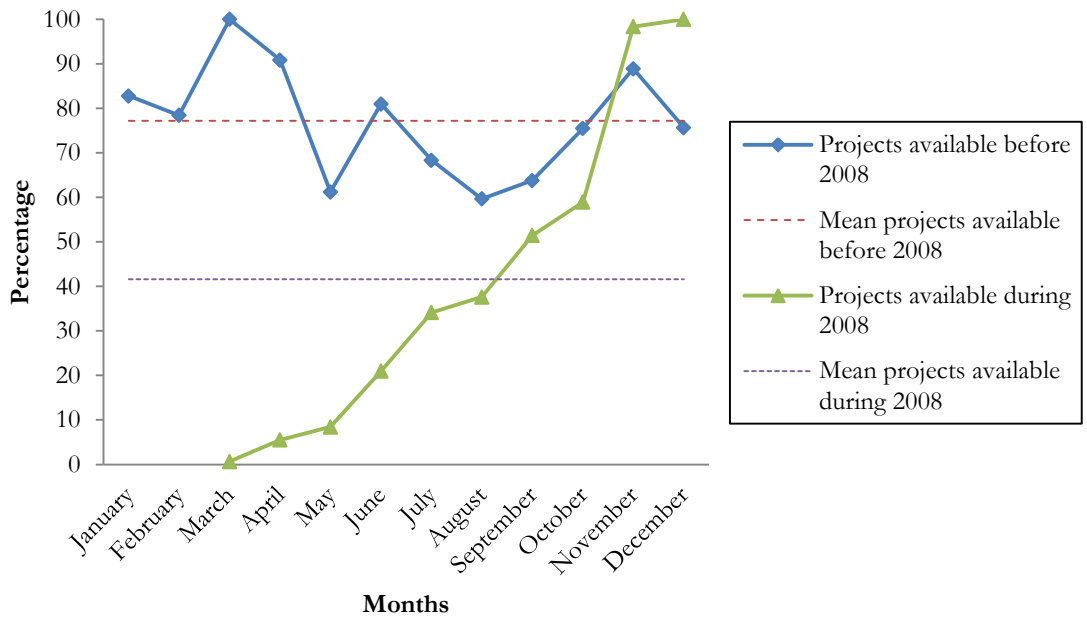
Therefore, it can be identified that longer established sites present more diverse patterns in terms of all the features. The projects sites made accessible during 2008, conversely, present a more homogeneous general pattern of increasing visits and unique IP addresses, but a decreasing one regarding the duration of the visits.

4.2.2.3.- Projects subsidiary sites' patterns: Grouping analysis

In order to facilitate the comparison with the other features, as mentioned before, projects have been grouped according to their starting date. Consequently, the *Relational museum*, the *Recovering the material and visual cultures of Southern Sudan* and the *Tibet Album* sites are grouped

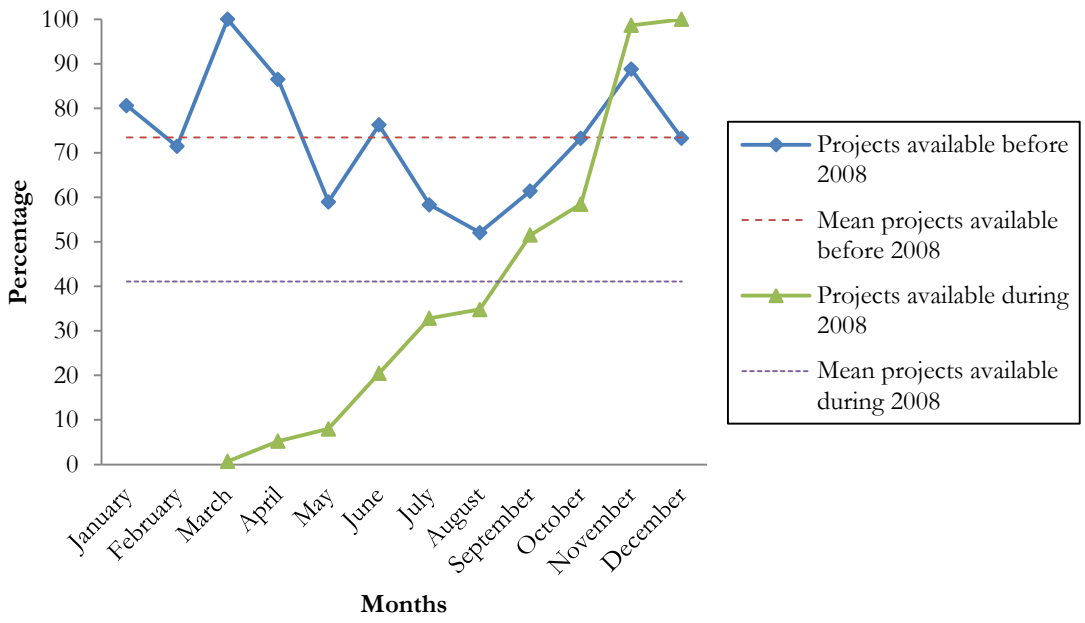
together and the *Arms and armour virtual gallery*, the *English artefacts in the Pitt Rivers Museum* and the *Luo visual history* are also grouped in order to homogenize the cases. The values of each case are obtained by the sum of the values of each month for every project on the group. In the case of the projects starting during 2008, March shows the value of the *Relational museum*, in April the one of the *Luo visual history* is added and, finally, from June on the value is obtained summing the three projects. After that procedure, two general cases are identified, namely, the one of the projects available before 2008 and the one of the projects starting during 2008.

Looking at the amount of virtual visitors received, the projects available before 2008 have received a total of 266,210 visitors during the whole year, while the projects of the other group were accessed by a total of 50,729 virtual visitors beginning in March. Logically, the annual mean of the projects available before 2008 is of 22,184 visits per month and the one of the projects made available along the year of 5,073 virtual visitors. Analysing the pattern of the amount of visitors, the projects available before 2008 show an irregular pattern with January (82.8) and February (78.4) above the mean (77.2) and the months of March (100.0) and April (90.8) scoring the highest values of the year. Subsequently, May (61.2) presents the second lowest amount of visitors of the year. The value increases in June (81.0) above the mean, but the next four months are again below the mean, being August (59.7) the month with the lowest amount of visitors. After another peak during November (88.9), the value for December is placed again below the mean (75.7). If the projects beginning during 2008 are the analysed ones, there is a clearly increasing model. Parting form a very low amount in March (.7), values increase gradually to reach 58.9 per cent during October. After that, the amount of visitors increases drastically on November (98.3) and reaches its highest peak during December. Consequently, the model of global usage of these two groups differs significantly because the longer established ones present a more irregular pattern, whilst the ones accessible after the beginning of 2008 show a clearly gradually increasing one.

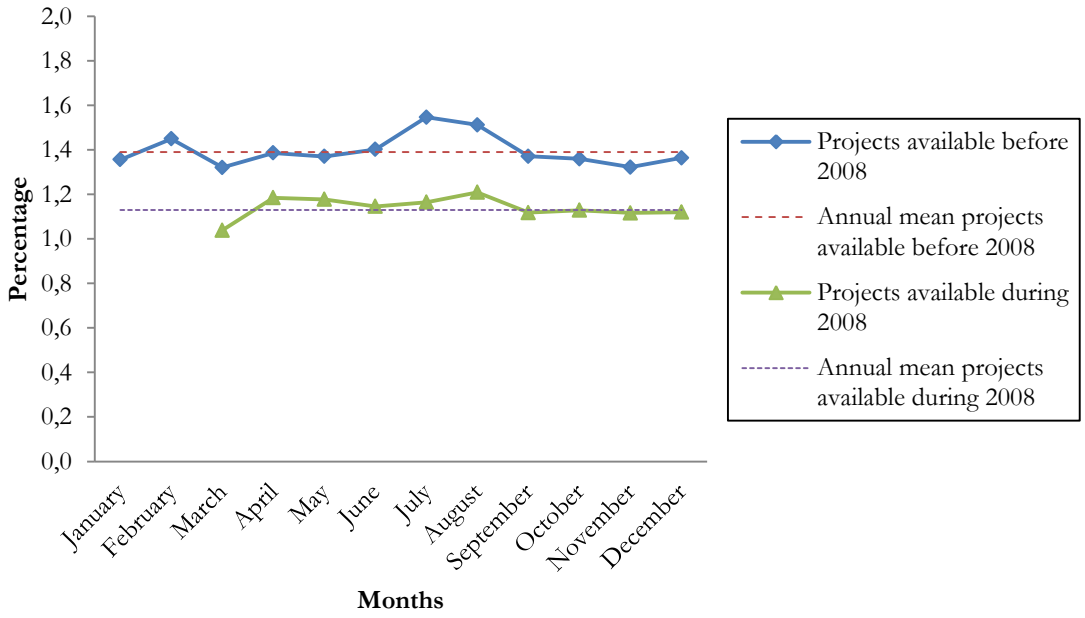


Graph 27: Visitors pattern by group of subsidiary websites during 2008 on the Pitt Rivers Museum website.

The unique IP addresses follow the same model than the total amount of visits, but with differences on the values. Looking at the projects available before 2008, the main difference can be identified during February, because its value (71.5) is below the annual mean (73.4), conversely to what happens with the total amount of visitors. Regarding the ratio of visits per IP address, most of the months present a ratio of 1.4. In fact, this value is the annual mean. Only March and November are below the mean (1.3), while July and August present the highest ratio of the whole year (1.5). If the projects beginning during 2008 are analysed, the increasing model is clearly identifiable, even with very similar ratios. In fact, the annual mean of the ratios of visits per unique IP addresses is of 1.1. Most of the months present this ratio, except for March (1.0) that is below the mean and April, May, July and August (1.2), which are above it. There, even though the total unique IP addresses pattern shows the same pattern as the one of the total visits, the ratio model shows a more stable profile. In the case of the projects made accessible during 2008, moreover, values are quite close to one, defining a low degree of visits repetition.



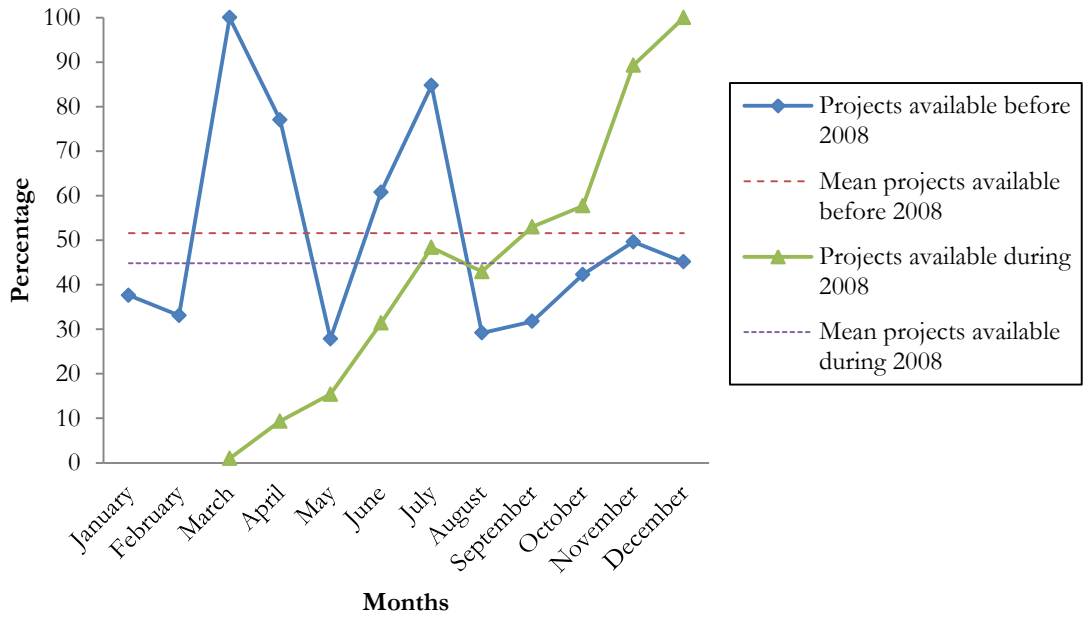
Graph 28: Unique IP addresses pattern by group of subsidiary websites during 2008 on the Pitt Rivers Museum website.



Graph 29: Ratio of visits per unique IP address pattern by group of subsidiary websites during 2008 on the Pitt Rivers Museum website.

The number of pages viewed pattern shows the most irregular pattern when dealing with sites available before 2008. It presents two extreme peaks during March (100.0) and April (77.0), as well as during June (60.8) and July (84.8), while all the rest of the months are even below the annual mean (51.6). The lowest value, moreover, is scored just between the two

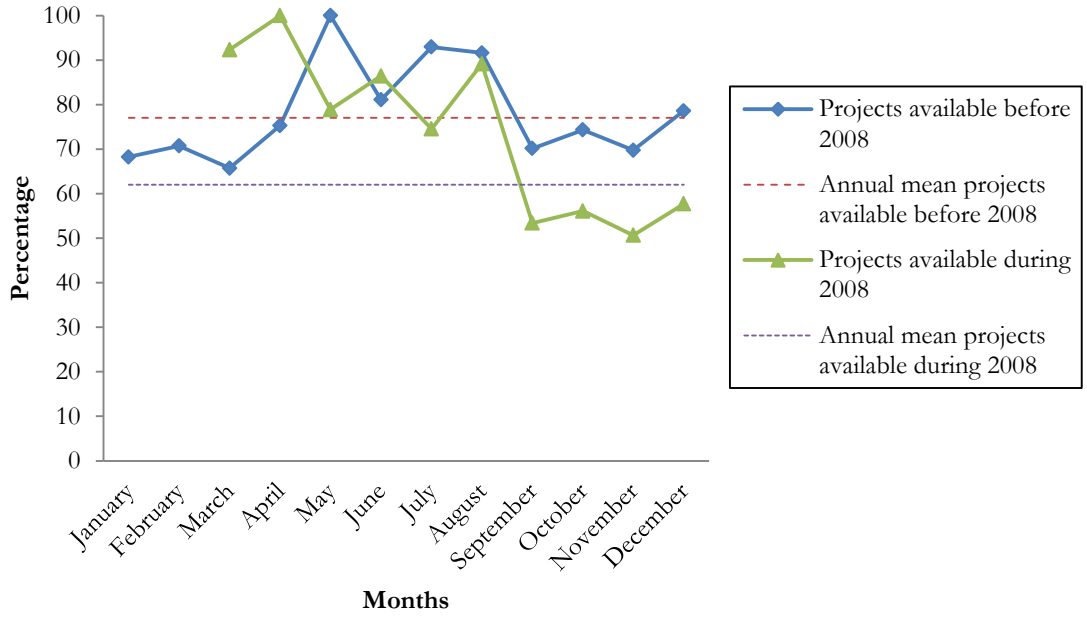
peaks, because May shows a value of 27.8. At the end of the year, there is another increase during October (42.3), November (49.6) and December (45.1), but always below the mean. Once again, the projects beginning on 2008 have an increasing model, but August presents a peculiarity, because, after July (48.4), it drops to 42.9. Besides, even though November is the second month with the highest value (89.3), the increase to December is the highest one compared to the visitors and unique IP addresses pattern.



Graph 30: Pages viewed pattern by group of subsidiary websites during 2008 on the Pitt Rivers Museum website.

Lastly, the duration of visits also show different patterns and differences on the total amount of seconds spent on the websites. Actually, the total amount of seconds spent on the sites of the projects available before 2008 is 70,061,941, which gives a mean duration of visits of 263 seconds. Taking a closer look at the projects beginning during 2008, the amount of seconds is considerably lower, namely 8,450,053 seconds. This value results in a mean duration of each visit of 167 seconds. Similarly, the patterns of the two groups differ analysing the duration of the visits. Regarding the projects established before 2008, there is a clear high season during the months of May (100.0), June (81.1), July (93.0) and August (91.6), where only June does not score a value above ninety per cent. The rest of the months, except for December (78.6), are below the annual mean (77.0). Besides, March presents the lowest value of the year with 65.7 per cent. When analysed the months beginning during 2008, the pattern differs, because September (53.4), October (56.1),

November (50.7) and December (57.7) are the only months below the annual mean (62.0). At the beginning of these projects, values are really high, because, although only one or two of them were available, March scores 92.3 per cent and April presents the highest the highest amount of the year. From this month on, the model shows continuous highs and lows until it scores 89.2 per cent in August. However, this model, after a high season that lasts until August, presents a lower season. When analysed the duration and the number of visits together, as in the general websites analysed on section *"4.2.1.- Museums websites analysis: general comparison of sites"*, there is a general identifiable inverse relation, with higher values in one of them coinciding with lower ones in the other.



Graph 31: Duration of visits pattern by group of subsidiary websites during 2008 on the Pitt Rivers Museum website.

Therefore, as happens when projects are analysed individually, longer established projects show a more irregular pattern of global usage, while sites established during 2008 present a general increasing model except for the duration of visits, where the lowest amount are scored at the end of the year.

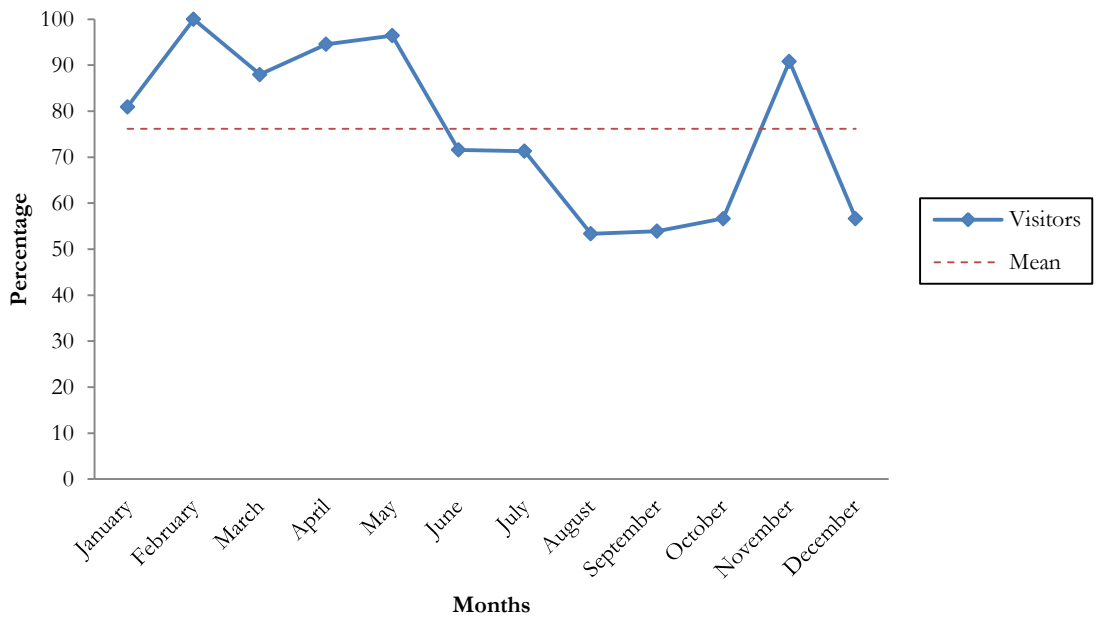
4.2.2.4.- Initial database users' analysis

The last of the features to be analysed in this section is the database part of the website of the Pitt Rivers Museum, which embraces the databases of objects and photographs of the institution. This feature is the most clearly academic research-oriented one, because it

delivers the technical information recorded on the entries of the museum in a strictly scientific way, even omitting the image of the objects and the photographs. Information obtained related to this features differs even in the structure with the previous one of the main site of the Pitt Rivers Museum and the resources of the projects, because, comparing to the time-oriented previous ones, this is more user related. Anyway, after a harmonization process, it has been adapted to the previous structure. Nevertheless, there is no duration of visit information and this part will be omitted in this analysis. As mentioned earlier, these data are provided on the academic year basis and do not entirely coincide with the natural 2008 year. That is why October is a sum of part of the 2007 and part of the 2008 and November and December refer to the 2007. However, for the pattern analysis, they have been treated as a unique year.

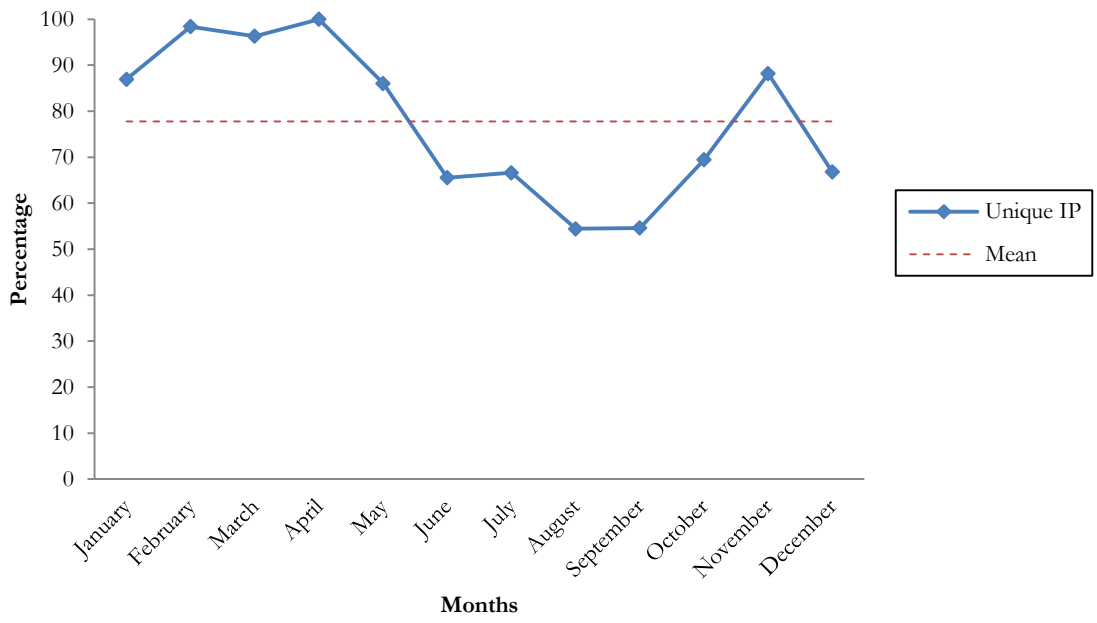
The first feature to be analysed is the amount of visitors to the database of the Pitt Rivers Museum. Due to the very structure of the recollected data, it is not possible to asseverate exactly the number of visits to the database. For this analysis, only visits accessing via the homepage of the section of the database will be considered[84]. Therefore, the amounts presented here are estimations that are close to the total number of visits, but not the precise amount. Adding the visits of the whole time span, the database section of the Pitt Rivers Museum has received 14,445 visits through twelve months. This amount gives an annual mean of 1,204 visits per month, but as usual there are variances on the amounts during the months, being August the one with the lowest amount of visits (843) and February the highest one (1,580). Looking at the pattern of visits, there is a clear higher season during the first five months of the year, with all the values above the annual mean (76.2). In fact, January is the month of this period with the lowest amount, but its value (80.9) scores even above four fifths of the total of February. June (71.6) and July (71.3) show a constant amount of visitors, but then it drops during August (53.4), September (53.9) and October (57.2). During November, however, it increases to 90.8 just to fall significantly again during December (56.6). So, after a high season, another lower one takes place on the database of the Pitt Rivers Museum, except for the peak during November.

[84] As will be seen later, there are some visits directly accessing to other pages.

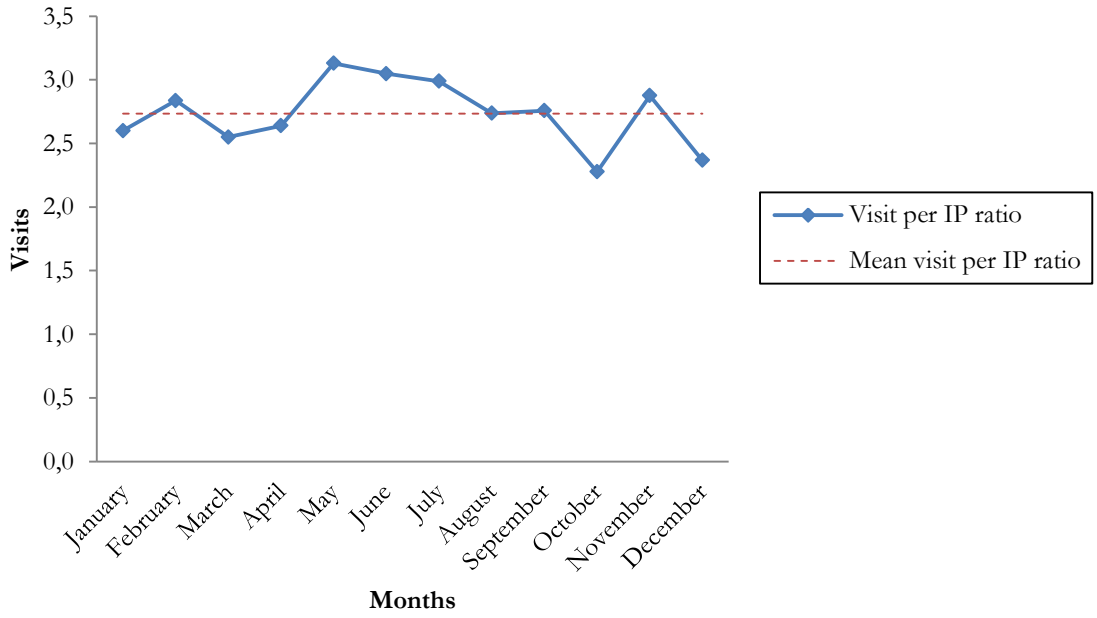


Graph 32: Visitors pattern to the Pitt Rivers Museum database from October 2007 to October 2008.

When the unique IP addresses are analysed, the pattern is similar to the one of the total visitors but with differences on the values and some characteristics. The months of February (98.4) and March (96.3) show really high values, but the peak of the year takes place during April. Months after May (86.0) are below the annual mean (77.8), except for November (88.2). October (69.4) and December (66.8) are also below the annual mean, but these values are closer to the mean than in the case of the total visitors. Anyway, as on the previous analysis, after a high season, there is a lower one broken by the case of November. Regarding the ratio of visits per unique IP addresses, the database of the Pitt Rivers Museum shows the highest value (2.7). The pattern of these ratios show a quite irregular model, but most of the months are around the annual mean. October (2.3) and December (2.4) are the months with the lowest ratio of visits per IP address, while May (3.1), June (3.0) and July (3.0) represent the period with the highest values for the ratio. Anyway, all the months represent the highest values of all the analysed sections.



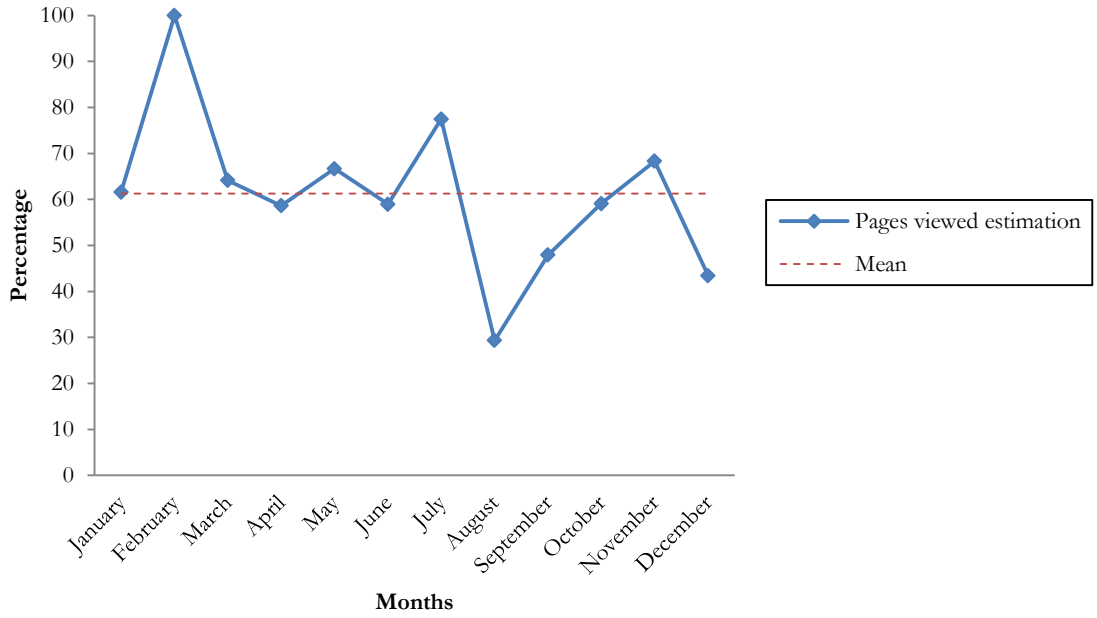
Graph 33: Unique IP addresses pattern to the Pitt Rivers Museum database from October 2007 to October 2008.



Graph 34: Ratio of visits per IP pattern on the database of the website of the Pitt Rivers Museum.

Finally, due to the absence of information of the duration related to the visits related to the time frame, the last feature to be analysed is the estimation of pages viewed per month. As mentioned before, the amounts shown here are an estimation obtained from the sum of the accesses to the homepage of the section, to the databases of objects and photographs, the searches on these databases, the navigation between records and the direct searches of

records. The total amount of pages viewed during the time span of twelve months has been of 89,538, giving an annual mean of 7,462 pages viewed per month. The top month in terms of pages viewed is February, with 12,174, whilst August represents the month with the lowest amount, since only 3,573 pages were viewed (29.3). Apart from February, July (77.5) is the other month significantly above the annual mean (61.3). Conversely, September (47.9) and December (43.4) are the months with the lowest values not taking into account August. Lastly, April (58.6) and October (59.1) are the only other months below the annual mean.



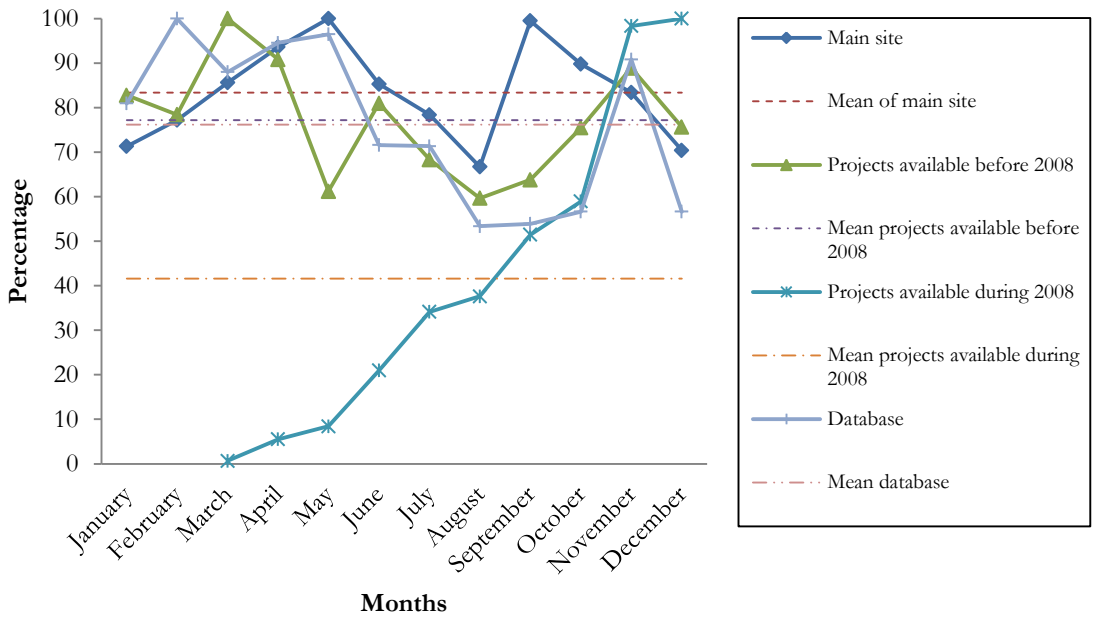
Graph 35: Pattern of the estimation of pages viewed per month on the database of the PRM

Consequently, the global models of general usage of the database of the Pitt Rivers Museum show an irregular pattern in all the cases, with the highest values always on the first half of the year. August and September are in all the cases among the months with the lowest values.

4.2.2.5.- Comparison of the pattern of the different parts

In order to compare the sections, all the information of the different sections is analysed together, except for the duration of the visits, due to the non-availability of this information for the database of the Pitt Rivers Museum. In this case, only the main site and the resources of the projects are taken into account. This comparison provides a general overview on similarities and differences of the diverse resources of a single website.

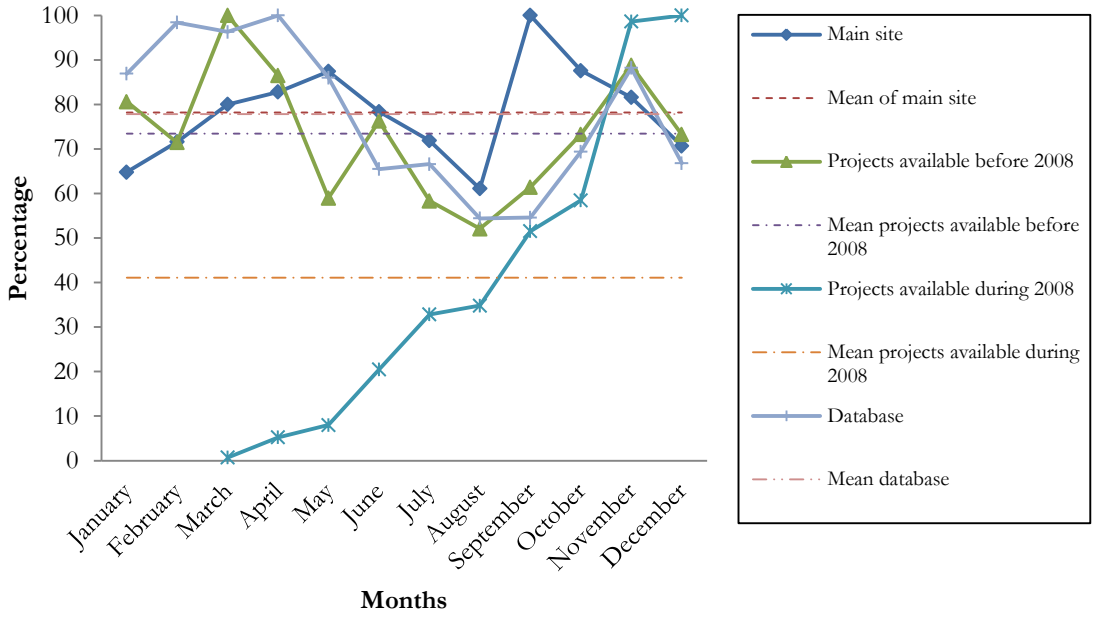
First of all, attending to the pattern of amount of visitors per month, the models of the diverse sections present different profiles of global use, with different peaks and lower values periods. Apart from the increasing model of the projects beginning during 2008, whose highest amount of visitors occurs at the end of the year, the rest of the sections present the highest amounts at the beginning of the year, except for the main site, which has another peak during September. In fact, the main site shows a peak during May and September, while the projects available before 2008 has it during March and, finally, the database during February, but accompanied by a high value also during May. Anyway, in all cases, except for the projects accessible during 2008, August represents the month with the lowest amount of total visitors. Similarly, the longer established projects and the database have both of them a peak during November.



Graph 36: Visitors pattern to the different sections of the Pitt Rivers Museum website.

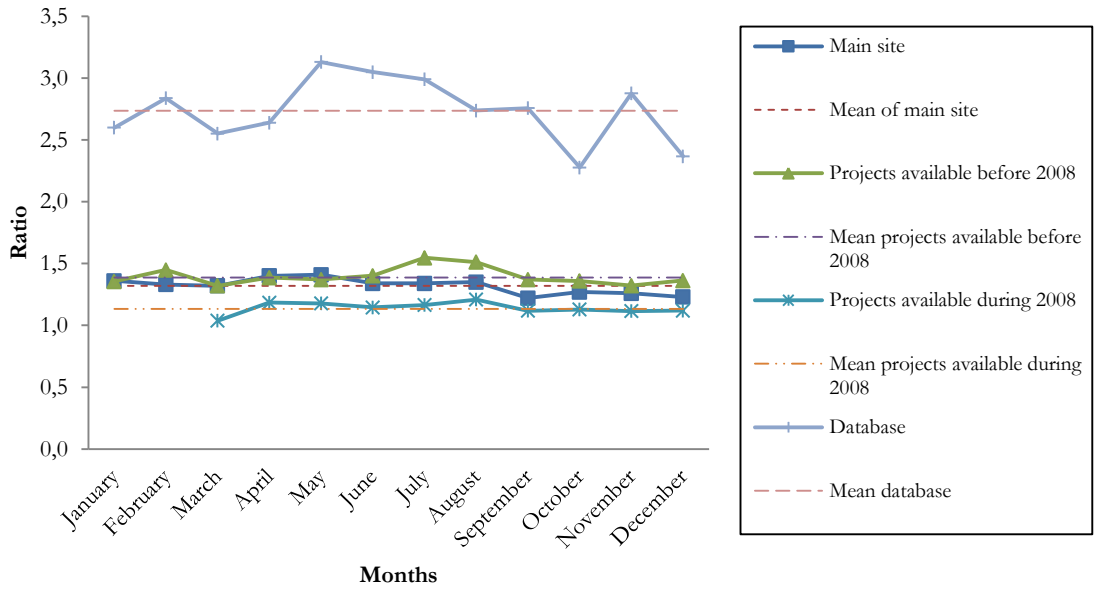
Regarding the unique IP addresses, the differences of patterns among the sections are more evident, because, apart from the model of the recent projects, the main site presents the highest amount during September, while the other sections maintain their highest values at the beginning of the year. The projects available before 2008 present a very similar pattern to the total visitors' one, but the database presents a substantial difference, because there is not a clear peak, but a more stable period of high values during February, March and April. The peak, in this case, anyhow, moves from February to April. August represents, once

again, the month with the lowest amounts for all the sections, except for the projects available only during 2008, and November represents a peak in the number of unique IP addresses for the longer established projects and the database. The projects made available during 2008 show again an increasing model.



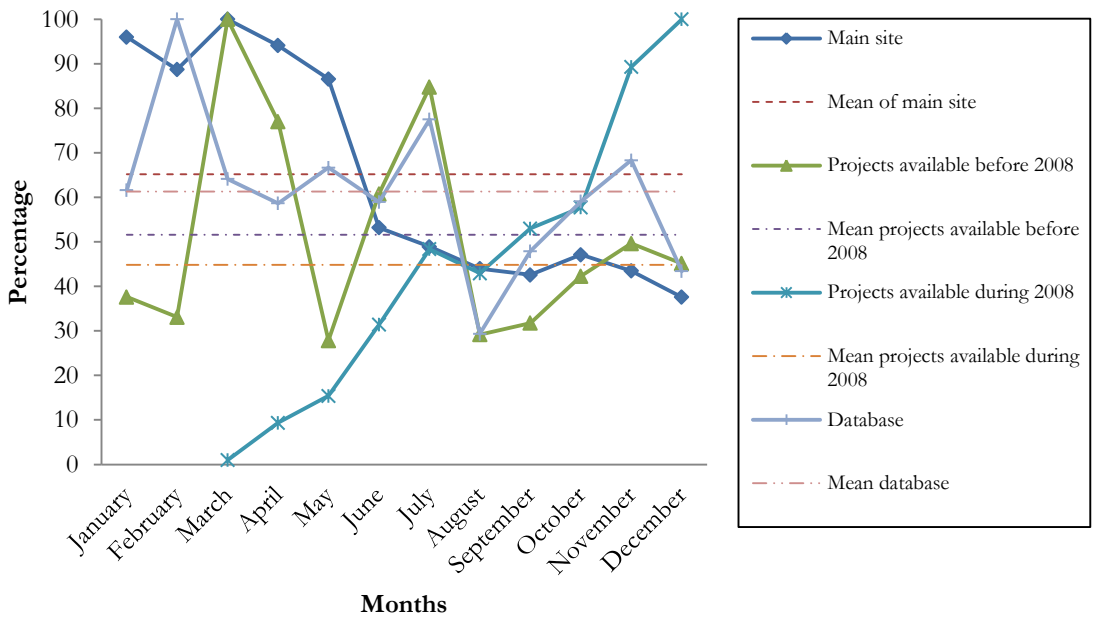
Graph 37: Unique IP addresses pattern to the different sections of the Pitt Rivers Museum website.

Looking at the pattern related to the ratio of visits per unique IP address, the main difference resides on the variance of visits per IP addresses. The database section of the Pitt Rivers Museum is the only one in which all the values exceed two visits per IP address, whilst in the rest of the cases the highest values score at most 1.5 visits per IP. Consequently, the database of the Pitt Rivers Museum is the section of the website more prone to the repetition of the visits. Additionally, while the rest of the section show quite constant models, the database presents a more irregular one, with a higher season during May, June and July and two considerable lower values during October and December.



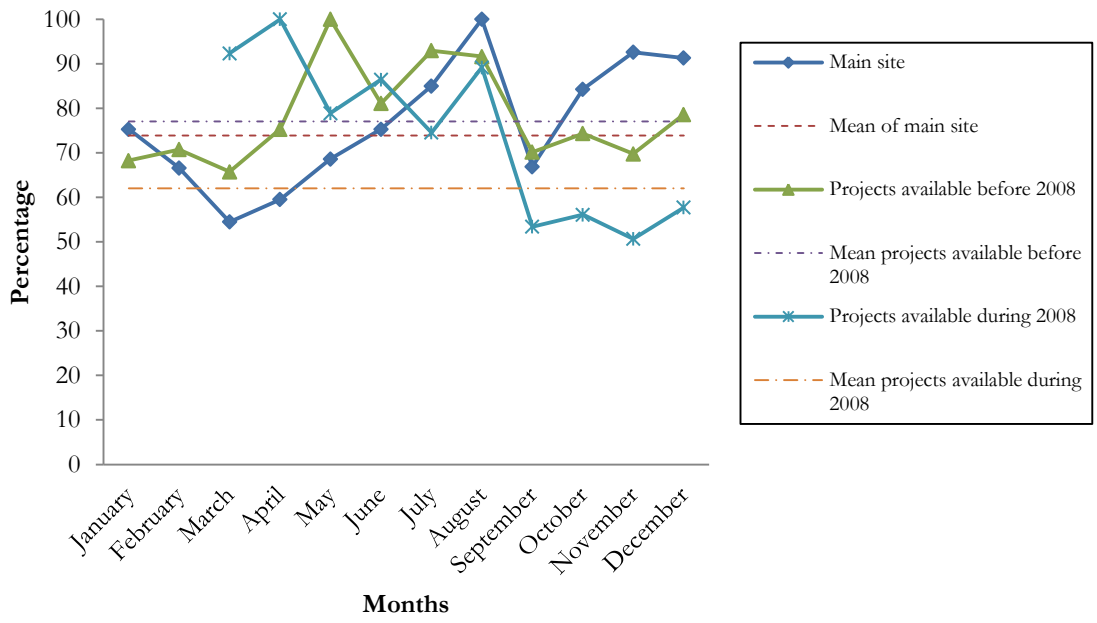
Graph 38: Ratio of visits per unique IP address on the different section of the website of the Pitt Rivers Museum during the analysed time span.

Dealing with the pattern of the total amount of pages viewed per month, the irregularity of most of the models is more evident, especially in the case of the projects available before 2008. Except for the globally increasing model of the projects beginning during 2008, the other three sections present their peaks in one of the three first months of the year. In fact, the database scores its highest value during February, while the other two sections do it on March. Once again, except for the projects beginning during 2008, August represents, if not the lowest value in all the cases, at least one of the lowest amounts of all the year. Similarly, July represents for both the projects available before 2008 and the database the second month in terms of total amount of pages viewed. Finally, in contrast to the increasing model of the projects made available during 2008, the main site presents a globally decreasing one related to the number of total pages viewed per month.



Graph 39: Pages viewed pattern to the different sections of the Pitt Rivers Museum website.

Finally, as mentioned before, the database is not included in the analysis of the duration of the visits, due to non-coincidence with the structure of the information provided. Once again, the irregularity of the models is easily identifiable. The peaks of the different projects differ on the month, but coincide in the period, because projects beginning during 2008 have it on April and the other ones on May. The main site, on the other hand, presents it during August, the same month that the other sections score the third longest duration. September shows in all the cases one of the shortest durations, if not the shortest one. Similarly, except for projects made accessible during 2008, the other sections have the shortest duration of visits during March.



Graph 40: Duration of visits pattern to the different sections of the Pitt Rivers Museum website.

Therefore, the comparison of the diverse sections of the Pitt Rivers Museum website shows some similarities and some differences. In general terms, the patterns of peaks of the different features do not coincide temporarily. Anyway, in some cases the lowest values or some of them take place during the same month. In fact, some of the lowest values take place during the summer season. So, although there are some similarities, there are different general pattern of use of the diverse features of the website of the Pitt Rivers Museum.

4.2.3.- Database users' weblogs analysis

Finally, the last section of this analysis aims at delimiting and identifying the patterns of the behaviour of the users of the database of the website of the Pitt Rivers Museum. The data available cover a twelve months' time span, starting on the 26th of October 2007 and finishing on the 25th of October 2008. The data provided by the institution is related to the behaviour of the users and, consequently, the analysis is user-centred and not time-centred as on the previous cases. As an introduction, however, a brief temporal overview on the patterns of the different actions on the database will be provided by the research[85]. After that, a user analysis will be performed, based not only on the frequencies of the actions on the database, but also on a clustering and factorial analysis. Lastly, some selected IP

[85] Once again, October refers to the sum of 2007 and 2008, November and December to 2007 and the rest of the months to 2008.

addresses will be individually analysed in order to better delimit their behavioural patterns by means of the characteristics of the visits and their paths.

4.2.3.1.- Brief overview of the global use of the database of the Pitt Rivers Museum

The global pattern of the database of the Pitt Rivers Museum is identified by the analysis of some general features, namely, the access to the homepage of the section, the access to the databases, the searches, the direct searches and the navigation between records[86]. The first general conclusion is that all of these features present their peak during the month of February. The total amount of accesses to the homepage of the database section is 14,445, with the highest amount during February (1,580) and the lowest one during August (843). The annual mean for this feature is of 1,204 accesses per month, representing 76.2 per cent of February. January (80.9), February (100.0), March (88.0), April (94.6) and May (96.5) represent the highest values of the year, adding to them November (90.8). Even though October and December (56.6) represent low values, August (53.4) and September (53.9) represent the lowest period of the year. Finally, June (71.6) and July (71.3) are below the annual mean.

Analysing the model of the accesses to the databases, the pattern is exactly the same. There are, anyway, some differences on the values. The total amount of accesses to the databases is 8,767, with the highest amount during February (984) and the lowest one on August (484). The annual mean is 731 accesses per month, which represents 74.2 of the highest amount. The pattern presents also a high period during the first five months of the 2008 with values above eighty per cent. Anyway, May (86.8) decreases slightly comparing to the accesses to the homepage of the section. November (87.8) represents another peak of the year. The rest of the months are below the mean, but August (49.2) and September (55.0) are the months with the lowest value of all.

The searches on the database are the last feature with similar pattern. The total amount of searches on the analysed time span is of 9,789. Once again, February represents the month with the highest amount (1,094), but in this case September, with 591 searches, represents the lowest amount and August just the third lowest one (623), even after December (617). Also in this case, after a peak during November (89.9 per cent), there is a period of high

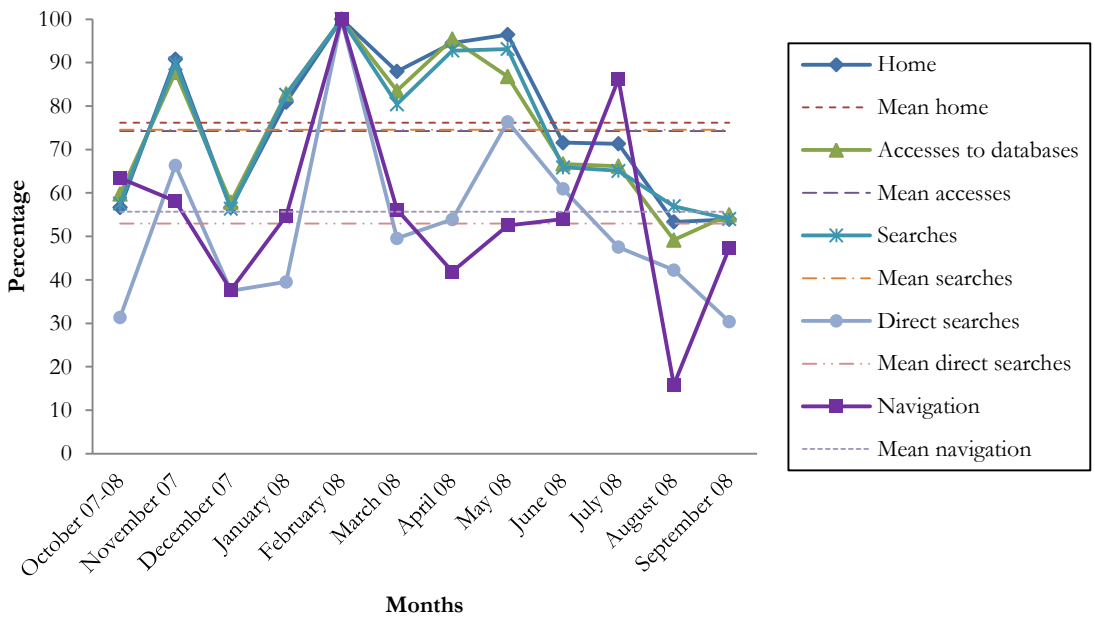
[86] The access to the databases of objects and photographs, as well as the searches on them will be further disaggregated for a specific analysis.

amounts of searches during the five first months of the year 2008. After May (93.1), a rapid decrease commences until the lowest value during September (54.0).

The direct searches, that is, the direct access to a record without searching, presents an irregular model with a clear peak during February (1037). The total amount of direct searches is 6,592, with an annual mean of 549. The lowest amount, in this case, is represented by September (315), closely followed by October (325). Looking at the general pattern, there are three peaks during the period of analysis. These peaks are represented by November (66.3), February (100.0) and May (76.4). April (53.9) and June (60.9) are the other months above the annual mean. From May on, the amount of direct searches decreases until the lowest one during September (30.4).

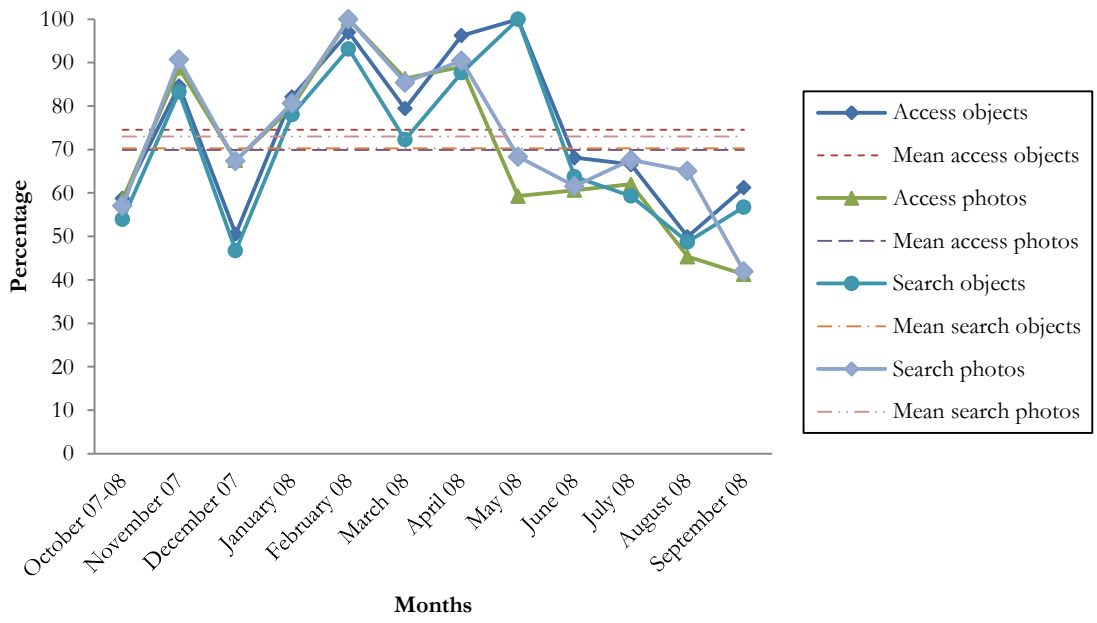
Lastly, looking at the navigation between records, the irregularity is easily identifiable. The total amount of navigation between records during the twelve months is 49,945, giving an annual mean of 4,162 pages per month. Also in this case, February is the month with the highest amount of navigation with 7,479. However, in this case July also presents a high value of 6,449, which represents 86.2 per cent of the highest one. Once again, August is the month with the lowest value and scores 1,185 records viewed. This value is the lowest in relative terms of all the database section with a 15.8. December (37.7) and April (41.9) are the other two lowest months, followed by September (47.3). Except for October (63.5), the rest of the months are placed around the annual mean (55.7).

Therefore, the access to the homepage of the database section, the access to the databases and the performance of searches present a very similar pattern with a peak during November and a high season during the first five months of the year. Direct searches and the navigation between records present a more irregular model. All of them, however, present the highest amount during February and some of the lowest ones generally during October, August and September.



Graph 41: General patterns in the database of the website of the Pitt Rivers Museum.

Analysing the pattern of the databases of objects and photographs separately, there are some differences among them. The first of them is the total amount of both accesses and searches on each of them. In both cases, the objects database presents higher amounts. In fact, the object database has a total of 5,698 accesses and 6,302 searches, while the database of the photographs has 3,069 accesses and 3,487 searches. Looking at the patterns, even though the model is quite similar, there is an obvious difference. While in the photographs database February is the peak month with 366 accesses and 398 searches, the peak on the database of objects is searched during May, with 637 accesses and 747 searches. In this latter case, however, February represents the second month with the highest value in terms of accesses (97.0) and searches (93.2). Taking a closer look at the months with the lowest amount, September is the month with the less accesses and searches in the database of photographs, whilst in the database of objects August (49.9) is the months with the lowest amount of accesses, closely followed by December (50.5), and this last month the one with the less searches (46.7) followed by August (48.7). Consequently, although there are some similarities on the models, the peaks and lowest months do not coincide when the objects and photographs databases are analysed separately.



Graph 42: Accesses and searches on the objects and photographs databases pattern on the website of the Pitt Rivers Museum from October 2007 to October 2008.

Therefore, analysing the global pattern of the use of the database section of the Pitt Rivers Museum, some differences and some similarities can be identified easily. Accesses to the database section, accesses to the different databases and searches present a peak on November and a high season on the first months of the year 2008. Direct searches and navigation between records, on the other hand, present a more irregular pattern. Analysing the databases separately, there are also differences on the months of higher and lower amounts. Anyway, February is always one of the highest values, if not the highest one, while some of the lowest ones are scored either on August or on September.

4.2.3.2.- Overview of the database users' analysis

After having delimited an overview of the global use of the database section of the website of the Pitt Rivers Museum, the research deals with the individual behaviour of each user. In this initial approach, the analysis identifies the descriptive character of the main features of users' behaviour, completing the general frequencies with some crosstabulations. The features analysed in this section are the total minimum seconds spent on the database by each user, the frequency and number of accesses to the homepage of the section and to the different specific databases, the navigation between records, the direct search of records, the change of view of the results and the repetition of these features. Additionally, a brief profiling of the IP addresses has been performed identifying the country of origin of the

user and its type[87]. According to the data provided by the Pitt Rivers Museum, from the 26th of October of 2007 to the 25th of October of 2008, 4,756 unique IP addresses have accessed the database section of the website of the institution.

First of all, the profile of the IP addresses has been obtained identifying the geographical origin of the virtual visitors and the type of institution. According to the data, seven tenths of the visitors come from Europe and other two from North America. Adding to these two groups the percentage of four per cent of visitors coming from Oceania, nearly ninety five per cent of the visitors to the Pitt Rivers Museum are embedded in the Western culture. Looking at the countries, visitors from the United Kingdom represent more than half of the sample, followed by American visitors that are less than a fifth of the total. These two countries are the only ones with a representation over a tenth, because the next countries are France (2.9), Germany (2.9), Canada (2.8) and Australia (2.6). Among the other countries, only the Netherlands (1.7), Italy (1.6) and New Zealand (1.0) represent at least one per cent of the sample of the visitors. In fact, all these countries contribute with more visitors than the whole South America and Africa, which score .8 and .6 respectively.

Table 128
Frequency and percentage of geographical origin of the visitors

	N	%
Europe	3330	70.0
- United Kingdom	2534	53.3
- France	138	2.9
- Germany	137	2.9
- The Netherlands	79	1.7
- Italy	75	1.6
North America	989	20.8
- USA	846	17.8
- Canada	131	2.8
Oceania	188	4.0
- Australia	124	2.6
- New Zealand	49	1.0
Asia	182	3.8
South America	36	.8
Africa	28	.6
Satellite	2	.0
N/A	1	.0

Analysing the type of visitor, more than four fifths have been identified as private users. Similarly, more than a tenth of the IP addresses (13.3) refer to universities or higher

[87] These features have been identified using the website *IP-address.com - IP Tracer and IP Locator* (URL: http://www.ip-adress.com/whois/, last accessed 27-11-2010), but maintaining the privacy of the users.

education centres. Taking into account that the Pitt Rivers Museum is closely linked to the University of Oxford, 4.8 per cent of the visitors access the database from this institution. The sum of the rest of types of visitors scores around three per cent of the total sample.

Table 129
Frequency and percentage of type of visitor

	N	%
Private visitor	3978	83.6
University, higher education centres	629	13.3
- University of Oxford	229	4.8
Education and learning centres and networks	90	1.9
Public or governmental institutions	37	.8
Means of communication	8	.2
Museums	4	.1
Other	6	.1
N/A	4	.1

Regarding the seconds spent on the database by the users, the research can only determine the minimum duration of the visits, because the exit of the users from the section is not recorded on the logs. Consequently, only the time spent until the performance of the last action can be determined with accuracy. The diversity on the total seconds spent on the database is easily identifiable, because none of the delimited time intervals represents even a fifth of the total sample. The interval with the most numerous users is the one of between eleven and thirty seconds, which consists of 18.6 per cent of the sample. If the interval between 31 and 60 seconds is added to the previous one, visitors spending at least between eleven seconds to one minute are three out of ten. Similarly, if the users spending between 61 and 120 seconds (12.5) and the ones between 121 and 300 seconds (15.4) are added, more than a fourth of the sample is represented by this new group. Being it so, more than half of the visitors have spent between at least eleven seconds and five minutes. Looking at the users spending a minimum of one second on this section, this group represents 5.6 per cent of the whole sample. Finally, around one per cent of the total sample forms the group of the visitors that have spent more than 7,200 seconds, that is, more than two hours in total.

Table 130
Frequency and percentage of seconds spent on the database by the users in interval

	N	%
1	264	5.6
2-10	390	8.2
11-30	886	18.6
31-60	551	11.6
61-120	595	12.5
121-300	733	15.4
301-600	482	10.1
601-1200	379	8.0
1201-1800	158	3.3
1801-3600	170	3.6
3601-7200	97	2.0
7201-10800	30	.6
10801-14400	12	.3
14401-18000	3	.1
+18000	6	.1

Regarding the features of the minimum duration of the visits, the sum of the minimum total seconds spent on the database section is 2,501,569, with the lowest minimum duration being one second and the maximum 30,256 seconds. Taking into account the total seconds spent on the database and the total number of visitors, the mean duration spent by these users on the database section is 526 seconds.

Table 131
Main features of the minimum duration of the visits to the database section in seconds

	N
Sum of the total minimum durations of visits	2,501,569
Lowest value of minimum duration	1
Highest value of minimum duration	30,256
Mean of minimum duration	526
Median of minimum duration	86

Thus, the average profile of the virtual user of the database of the Pitt Rivers Museum corresponds with a private visitor coming from Anglo-Saxon countries mainly, spending a minimum amount of seconds between eleven and three hundred, even though the mean minimum duration of visits scores 526 seconds.

When analysed the main actions on the database, they have been identified as the access to the homepage, the start of a database, the opening of a record, the search on a database, the navigation between records, the direct search of a record and the change of view of the results. Regarding the access to the homepage, most of the virtual visitors make use of this option, because it scores 97.2 per cent of the sample. The searches within the database

(82.8), the opening of a record (82.2) and the start of a database (82.1) are utilized by more than four fifths of the total amount of the virtual visitors to the database of the Pitt Rivers Museum. On the other hand, the navigation between records (18.8) and the direct search of a record (18.1) take place among less than a fifth of the total sample in both cases. Finally, less than a tenth of the virtual visitors change the template to view the records and results of the searches (9.9). Thus, there is a great difference between the accesses to the homepage, the starts of a database, the openings of a record and the searches on a database on the one hand and the navigation between records, the direct search of a record and the change of view on the other.

Table 132
Frequency and percentage of the main actions on the database

	N	%
Access to homepage	4622	97.2
Start of databases	3907	82.1
Open of a record	3910	82.2
Search database	3940	82.8
Navigation between records	894	18.8
Direct search	862	18.1
Change of view	470	9.9

Related to the accesses via homepage of the database section, it has to be taken into account that it represents the most widespread action among the users of the section, because 97.2 per cent of them do access this way. Among these users, 87.7 per cent access to the homepage of the database section only on one session and around a tenth of them on between two and five sessions. Looking at the number of accesses via homepage, percentages vary greatly, because users accessing only once decrease to around two fifths of the visitors that make use of this option. Users accessing between twice and five times, conversely, increase and their percentage nearly reaches half of the sample. Similarly, the percentage of users who have accessed the database section between six and ten times represents six per cent of this sample. So, the values of the number of accesses are higher than the ones of the frequencies, except for the users that are represented by a single access.

Table 133
Frequency of accesses to the homepage of the database section, percentage of the total and percentage of those who access

	N	%	% of those who access
1	4054	85.2	87.7
2-5	473	9.9	10.2
6-10	57	1.2	1.2
11-25	28	.6	.6
26-50	8	.2	.2
51-100	1	.0	.0
+100	1	.0	.0

Table 134
Number of accesses to the homepage of the database section, percentage of the total and percentage of those who access

	N	%	% of those who access
1	1924	40.5	41.6
2-5	2280	47.9	49.3
6-10	279	5.9	6.0
11-25	107	2.2	2.3
26-50	26	.5	.6
51-100	5	.1	.1
+100	1	.0	.0

Taking into account the main features of the access via home to the database section, the total sum of the frequency of accesses is 6,564, being the maximum frequency 152. The total amount of frequencies in relation to the users, the mean frequency per IP address is of 1.4. Similarly, the total sum of the number of accesses is 13,089, with a maximum number of 208. In this case, the mean number of accesses is 2.8 per IP. Consequently, these values show that the number of accesses double the ones of the frequencies, except for the maximum number.

Table 135
Main features of the access via home to the database section

	N
Total sum of frequency of access	6564
Maximum frequency of access	152
Mean frequency of accesses	1.4
Total sum of number of accesses	13089
Maximum number of accesses	208
Mean number of accesses	2.8

Regarding the users that start any database on the section, it has to be said that they represent 82.1 of the total sample. From this restricted sample, nearly ninety per cent of the users have started a database only during one session and less than a tenth during between

two and five sessions. As happens with the accesses via home, when dealing not with the frequency, but with the number of starts of the database, percentage for the repetition of starts increase. In fact, users starting any database only once decrease to 56.4. In this case, moreover, users that have started any database between twice and five times represent a third of the sample that starts them. Similarly, nearly five per cent of the sample start any of the databases between six and ten times. Consequently, this feature follows a similar pattern to the one of accesses via home, because all the intervals increase their percentages, except for the one referring to a single start. Additionally, even higher intervals take place when dealing with the number of starts of the databases.

Table 136
Frequency of start of the database section, percentage of the total and percentage of those who start

	N	**%**	**% of those who start**
1	3490	73.4	89.3
2-5	371	7.8	9.5
6-10	34	.7	.9
11-25	11	.3	.3
+25	1	.0	.0

Table 137
Number of starts of the database section, percentage of the total and percentage of those who start it

	N	**%**	**% of those who start**
1	2202	46.3	56.4
2-5	1453	30.5	37.2
6-10	188	4.0	4.8
11-25	46	1.0	1.2
26-50	17	.4	.4
+50	1	.0	.0

Taking into account the previous percentages, the research has identifies that a third from this specific sample repeat the starting of any database during the same session and 2.9 repeat this action on different sessions. When these two variables are combined together, results show that 7.6 of the sample repeat both during the same session and on different ones the start of a database.

Table 138
Number of repetition of starts of the database section, percentage of the total and percentage of those who start it

	N	%	% of those who start
Repetition of the start during the same session	1295	27.2	33.1
Start during different sessions	114	2.4	2.9
Both repetitions	298	6.3	7.6

Analysing the main features of the start of any database of the section, the total sum of the sessions starting any database gives as result 4,853, being the maximum frequency of starts 26. The mean frequency of starts of a database by unique users scores 1.2. Similarly, the total sum of the number of starts is 8,760, being 74 the maximum number by a single visitor. The mean number of starts by each IP address, in this case, scores 2.2. Finally, regarding the database started, 47.7 of the visitors only start the objects' one and 27.4 per cent the database of the photographs. Visitors making use of both databases represent a fourth of this sample.

Table 139
Main features of the start of a database

	N
Total sum of frequency of starts	4853
Maximum frequency of starts	26
Mean frequency of starts	1.2
Total sum of number of starts	8760
Maximum number of starts	74
Mean number of starts	2.2

Table 140
Frequency of started database, percentage of the total and percentage of those who start any

	N	%	% of those who start
Objects database	1864	39.2	47.7
Photographs database	1070	22.5	27.4
Both databases	973	20.5	24.9

Attending to the next feature, namely, the open of a record, 82.2 of the virtual visitors make use of this option. Among these users, nearly ninety per cent open records during a single session and nearly other tenth on between two and five different sessions. These percentages vary significantly when dealing with the number of opens of a record, because users opening only a record represent 43.5 of this sample and the ones opening between two and five records score 38.6 per cent. As happens with the previous main features, other percentages also increase, because users opening between six and ten records and

those opening between eleven and twenty-five records represent 11.0 and 5.7 per cent of this sample respectively. Once again, percentages representing intervals with a more numerous amount of opens are higher dealing with the absolute number than with the frequency.

Table 141
Frequency of opens on the database section, percentage of the total and percentage of those who open any record

	N	%	% of those who open
1	3496	73.5	89.4
2-5	373	7.8	9.5
6-10	29	.6	.7
11-25	10	.2	.3
+25	2	.0	.1

Table 142
Number of opens on the database section, percentage of the total and percentage of those who open any record

	N	%	% of those who open
1	1702	35.8	43.5
2-5	1510	31.8	38.6
6-10	429	9.0	11.0
11-25	224	4.7	5.7
26-50	29	.6	.7
51-100	13	.3	.3
+100	3	.1	.1

Regarding these percentages, 45.9 per cent of this sample repeat the opening of any record during a same session and about one per cent on different sessions. Once identified the users that open records repeatedly both during the same session and different ones, they represent 9.1 of this delimited sample.

Table 143
Number of repetition of opens on the database section, percentage of the total and percentage of those who open any record

	N	%	% of those who open
Repetition of the open during the same session	1794	37.7	45.9
Open during different sessions	59	1.2	1.5
Both repetitions	355	7.5	9.1

Looking at the main features of the open of a record action, the total sum of the sessions reflecting it scores 4,835, being 35 the maximum frequency of open of a record. In this case, the mean frequency of opening a record is 1.2 per IP address. Regarding the total sum

of the number of opens, it is 15,001, with a maximum number of 165 by a single user. These values give a mean number of 3.8 opens by each different visitor to the database. Almost all the users that utilize this option use the mere open option.

Table 144
Main features of the open of a record

	N
Total sum of frequency of opens	4835
Maximum frequency of opens	35
Mean frequency of opens	1.2
Total sum of number of opens	15001
Maximum number of opens	165
Mean number of opens	3.8

Table 145
Frequency of open option, percentage of the total and percentage of those who open any record

	N	%	% of those who open
Open	3841	80.8	98.2
Open sort	0	.0	.0
Both	69	1.5	1.8

When the searches performed on the databases are analysed, results identify that 82.8 of the total sample search within the different databases of the section. Among them, 89.4 per cent perform any search only during a single session and little less than a tenth on the interval of two and five sessions. Equally to the other main actions, when dealing with the number of searches and not their frequency, the percentage of those only searching once decreases to 53.6, but the rest of the intervals increase significantly. Actually, more than a third search between twice and five times, 5.5 per cent between six and ten times and a little less than two per cent between eleven and twenty-five times. Thus, also in this case the number of searches is higher than the frequency.

Table 146
Frequency of searches on the database, percentage of the total and percentage of those who search

	N	%	% of those who search
1	3522	74.1	89.4
2-5	375	7.9	9.5
6-10	30	.6	.8
11-25	12	.3	.3
+25	1	.0	.0

Table 147
Number of searches on the database, percentage of the total and percentage of those who search

	N	%	% of those who search
1	2111	44.4	53.6
2-5	1520	32.0	38.6
6-10	215	4.5	5.5
11-25	72	1.5	1.8
26-50	17	.4	.4
+50	5	.1	.1

Among all the users who perform any search, more than a third of the sample repeat searches during the same session, while 2.6 per cent perform searches on different sessions on the database. Combining these two variables, the research has identified that eight per cent of the users performing searches do it repeatedly during both the same session as well as on different ones.

Table 148
Number of repetition of searches on the database section, percentage of the total and percentage of those who search

	N	%	% of those who search
Repetition of searches during the same session	1411	29.7	35.8
Searches during different sessions	101	2.1	2.6
Both repetitions	315	6.6	8.0

Taking a closer look at the main features of the searches, the first finding remarks that searches have been performed in a total of 4,891 sessions, with a maximum of 33 different ones by a single visitor. The mean frequency of performance of searches by a user is 1.2. Looking at the number of searches, values double, because the total amount of the searches is 9,793 and the mean number by user increases to 2.5. Moreover, the maximum number of searches performed by a single user scores 87. Finally, regarding the database used to perform the searches, 480 of the users search within the objects' database and other 27.4 within the photographs' one. On the other hand, nearly a quarter of the users perform searches on both databases.

Table 149
Main features of the searches on the database section

	N
Total sum of frequency of searches	4891
Maximum frequency of searches	33
Mean frequency of searches	1.2
Total sum of number of searches	9793
Maximum number of searches	87
Mean number of searches	2.5

Table 150
Frequency of searched database, percentage of the total and percentage of those who search

	N	%	% of those who search
Objects database	1890	39.7	48.0
Photographs database	1081	22.7	27.4
Both databases	969	20.4	24.6

Analysing the navigation between records by the users, the total amount of them using this option represents 18.8 per cent of the total sample, being the first main action with representativeness below a fifth of the sample. Among these users, 86.6 per cent navigate during a single session and another 12.6 do it on the interval of two and five different sessions. Looking at the total number of pages viewed, the variety increases drastically. In fact, only a tenth navigate to a single result and 22.3 of the users navigating view between two and five pages. The intervals from six pages to ten until the one between 51 and a hundred pages show percentages above a tenth of this sample, being the highest one 17.0 per cent for the interval eleven to twenty-five pages and the lowest 11.4 for the one between 51 and a hundred pages. From these intervals on, percentages drop below a tenth of this sample.

Table 151
Frequency of navigation between records, percentage of the total and percentage of those who navigate

	N	%	% of those who navigate
1	774	16.3	86.6
2-5	113	2.4	12.6
6-10	6	.1	.7
+10	1	.0	.1

Table 152
Number of pages viewed, percentage of the total and percentage of those who navigate

	N	%	% of those who navigate
1	90	1.9	10.1
2-5	199	4.2	22.3
6-10	125	2.6	14.0
11-25	152	3.2	17.0
26-50	115	2.4	12.9
51-100	102	2.1	11.4
101-250	43	.9	4.8
251-500	50	1.1	5.6
501-1000	12	.3	1.3
+1000	6	.1	.7

Among the users who navigate between records, more than three fourths navigate more than to a single record during the same session and not a significant amount of the sample navigates only on different sessions. The combination of these two types of repetition, on the other hand, takes place in 13.6 per cent of this sample, meaning that nearly all the ones repeating navigation on different sessions also do it on the same session.

Table 153
Number of repetition of navigation between records, percentage of the total and percentage of those who navigate

	N	%	% of those who navigate
Repetition of the navigation during the same session	679	14.3	76.0
Navigation during different sessions	3	.1	.3
Both repetitions	122	2.6	13.6

Regarding the main features of the navigation between records, a total of 1,120 sessions present it, being the maximum frequency of navigation by a single user eleven. The mean of sessions in which navigation takes place per user is 1.3. If the number of pages is analysed, values increase significantly, with a total of 49,939 pages viewed. The maximum number of pages viewed by a single user is 1,876 and the mean by user 55.9. Most of these pages are viewed making use of the option showing the next record, because this option has been utilized 44,587 times and the option showing the previous record only 5,110. This difference is also identifiable looking at the maximum number of uses per option by user and the mean, because the next record has been shown a maximum of 1,620 times and a mean of 49.9 times per visitor and the previous record 365 and 5.7 times respectively.

Table 154
Main features of the navigation between records on the database section

	N
Total sum of frequency of navigation	1120
Maximum frequency of navigation	11
Mean frequency of navigation	1.3
Total sum of number of pages viewed	49939
Maximum number of pages viewed	1876
Mean number of pages viewed	55.9
Total sum of next	44587
Maximum number of next	1620
Mean number of next	49.9
Total sum of previous	5110
Maximum number of previous	365
Mean number of previous	5.7

Related to the option of the direct search of a record, 18.1 of the total sample make use of it. Nine out of ten of this sample use the direct search on a single session and about eight per cent on an interval between two and five different sessions. Once again, when looked at the number of direct searches, above a fifth only search directly a record once, but 45.7 per cent of this sample search directly between twice and five times. Users searching a record directly between six and ten times represent 16.7 per cent and the ones between eleven and twenty-five times 10.8 of this sample. Similarly, 4.2 per cent search directly a record between 26 and fifty times and the ones searching directly between 51 and a hundred times represent about one per cent of this sample.

Table 155
Frequency of direct search, percentage of the total and percentage of those who direct search

	N	%	% of those who direct search
1	788	16.6	91.4
2-5	70	1.5	8.1
+5	4	.1	.5

Table 156
Number of direct searches, percentage of the total and percentage of those who direct search

	N	%	% of those who direct search
1	182	3.8	21.1
2-5	394	8.3	45.7
6-10	144	3.0	16.7
11-25	93	2.0	10.8
26-50	36	.8	4.2
51-100	8	.2	.9
+100	5	.1	.6

Among the users that utilize the direct search of a record, seven tenths repeat this function during the same session and less than one per cent (.7) on different sessions. These two different types of repetition take place together in 7.5 per cent of this sample.

Table 157
Number of repetition of direct searches, percentage of the total and percentage of those who direct search

	N	%	% of those who direct search
Repetition of direct search during the same session	609	12.8	70.6
Direct search during different sessions	6	.1	.7
Both repetitions	65	1.4	7.5

Analysing the main features of the direct searches, they occur in a total of 986 different sessions, being the maximum for a single visitor 7 and the mean frequency of direct searches 1.1. If the number of direct searches is analysed, values present a drastic increase, because the total number of direct searches is 6,507 and the mean number 7.6. Similarly, in this case, the maximum number of direct searches by a single user is 221. Looking at the mode of direct search used, nearly four fifths of this sample use the one by the record number, while 7.3 per cent use the ID of the object. Additionally, other 13.3 per cent of this sample make use of these two options to search any record directly.

Table 158
Main features of the direct searches on the database section

	N
Total sum of frequency of direct searches	986
Maximum frequency of direct searches	7
Mean frequency of direct searches	1.1
Total sum of number of direct searches	6507
Maximum number of direct searches	221
Mean number of direct searches	7.6
Total sum of direct searches by record number	5940
Total sum of direct searches by ID	589

Table 159
Frequency of mode of direct search, percentage of the total and percentage of those who direct search

	N	%	% of those who direct search
By record number	684	14.4	79.4
By ID	63	1.3	7.3
Both	115	2.4	13.3

Finally, when the change of view of the template of the databases is analysed, not even a tenth of the total sample use this option. When only these visitors are analysed, something

less than nine tenths of this sample use the change view option during a single session and more than a tenth during between two and five sessions. Analysing the number of times the viewing template has been changed, users changing only once represent less than a third of this sample, while the ones changing between two and five times are more than half of this amount of cases. In this case, moreover, more than a tenth of this sample change view between six and ten times and about five per cent between 11 and 25 times. Lastly, about one per cent changes the view of the template between 26 and 50 times.

Table 160
Frequency of change view, percentage of the total and percentage of those who change view

	N	%	% of those who change view
1	418	8.8	88.9
2-5	52	1.1	11.1

Table 161
Number of change view, percentage of the total and percentage of those who change view

	N	%	% of those who change view
1	151	3.2	32.1
2-5	238	5.0	54.9
6-10	53	1.1	11.3
11-25	23	.5	4.9
26-50	4	.1	.9
+50	1	.0	.2

Among the sample of users that change this view, more than half of this sample (56.8) repeat the change of view of the template during the same session and 1.3 per cent change view on different sessions. The combination of these two kinds of repetition takes place in slightly less than a tenth (9.8) of this sample.

Table 162
Number of repetition of change view, percentage of the total and percentage of those who change view

	N	%	% of those who change view
Repetition of changes of view during the same session	267	5.6	56.8
Changes of view during different sessions	6	.1	1.3
Both repetitions	46	1.0	9.8

Looking at the main features of the option to change the viewing template of the database, it has been used during 538 different sessions, being 4 the maximum frequency of changes of view by a single user. The mean frequency of the change of view by user is 1.1. The

number of changes of view scores in total 1,783, being the maximum number 91 and 3.8 the mean number by IP address. Regarding the different ways of viewing the results, the table option is used 712 times, the form one in 321 times and the list one in 752 times. Taking into account the different combination of these options, there are different degrees of use. The list form merely is used by three tenths and the list combined with the table option in more than a fifth of the sample. The combination of the three options together is used by a fourth of the sample. The rest of the combinations are used by less than a tenth of this sample, being 9.1 the highest percentage, which corresponds with the mere use of the table option.

Table 163
Main features of the change of view of the records

	N
Total sum of frequency of change view	535
Maximum frequency of change view	4
Mean frequency of change view	1.1
Total sum of number of change view	1783
Maximum number of change view	91
Mean number of change view	3.8
Total sum of change view to table option	712
Total sum of change view to form option	321
Total sum of change view to list option	752

Table 164
Frequency of mode of change view, percentage of the total and percentage of those who change view

	N	**%**	**% of those who change view**
Table	43	.9	9.1
Form	16	.3	3.4
List	143	3.0	30.4
Table and form	22	.5	4.7
Table and list	106	2.2	22.6
Form and list	23	.5	4.9
Three of them	117	2.5	24.9

When the combinations of the different main options are analysed, the representativeness of the diverse ones differs greatly. While the different bilateral combinations between accesses via the home, the start of a database, the opening of a record and the performance of searches score always above four fifths, the navigation is combined with the previous actions in more than eighteen per cent and the direct search in seventeen per cent. The combination of these two options takes place in a tenth of the sample and any combination with the change of view scores in all the cases below this percentage. Analysing the

percentage of the main actions by option, access via home, start of a database, open of a record and the performance of searches are present in more than 95.0 per cent, except for their presence among the cases with access via home, where percentages are around 84.0 per cent. The pattern for this option is the same when combined with the navigation between records and the direct searches of a record, because while the rest of the options score values above 22.0 and 21.0 per cent respectively, they represent 19.0 and 17.9 per cent in the case of visitors accessing via home. If dealing with the change of view, the values of users accessing via home score 9.8 and the other three exactly 11.6. Among the other combinations, the presence of changes of view among the users that navigate between records is the lowest one, scoring 34.0 per cent of the sample, and the presence of direct searches among users that change view is the highest one, with 76.1 per cent.

Table 165
Contingency table of the main actions on the database section in frequency and percentage of the total

		N of the total						
		Home	**Start**	**Open**	**Search**	**Navigation**	**Direct search**	**Change view**
% of the total	**Home**	---	3882	3873	3889	880	827	455
	Start	81.6	---	3855	3883	876	824	452
	Open	81.4	81.1	---	3886	884	830	455
	Search	81.8	81.6	81.7	---	885	829	457
	Navigation	18.5	18.4	18.6	18.6	---	515	304
	Direct search	17.4	17.3	17.5	17.4	10.8	---	334
	Change view	9.6	9.5	9.6	9.6	6.4	7.0	---

Table 166
Contingency table of the main actions on the database section in percentage of the total of the action

		Home	**Start**	**Open**	**Search**	**Navigation**	**Direct search**	**Change view**
% of the action	**Home**	---	84.0	83.8	84.1	19.0	17.9	9.8
	Start	99.4	---	98.7	99.4	22.4	21.1	11.6
	Open	99.1	98.6	---	99.4	22.6	21.2	11.6
	Search	98.7	98.6	98.6	---	22.5	21.0	11.6
	Navigation	98.4	98.0	98.9	99.0	---	57.6	34.0
	Direct search	95.9	95.6	96.3	96.2	59.7	---	38.7
	Change view	96.8	96.2	96.8	97.2	64.7	71.1	---

Consequently, among the various options present on the database, there are some of them more spread than others. In fact, nearly all users access via home and more than four fifths

start a database, open a record and search on the database, but less than a fifth navigate between records or search a record directly and even less than a tenth change the viewing template. Thus, the more general actions are also the more popular ones, while the more specific ones have a shorter reach. In all the cases, the most popular frequency of use of the option is one, but the number of use is higher as the different means denote. Anyway, there are significant differences between visitors' use of the options.

4.2.3.3.- Cluster analysis of the users

Once the main features of the frequencies of the use of the database section of the Pitt Rivers Museum website have been analysed, the objective of the research is to identify possible groups of similar behaviour among the virtual visitors. This clustering process has been carried out using different analytical methods. First of all, a hierarchical clustering analysis has been performed as an exploratory approach, visualized on the figure of a dendrogram. According to the results of the previous analysis, a specific number of groups will be identified and evaluated using the more in-depth cluster analysis of the K-means of some specific variables. Additionally, after the analysis of each cluster, the research performs a factorial analysis that groups diverse variables and creates clustering factors.

Hierarchical analysis

For this initial exploratory approach to the clustering process, the research has used a hierarchical cluster analysis. Having as the main aim the identification of different potential models of use, the variables selected for the analysis have been the ones dealing with the main actions that can be performed on the database section. Therefore, the variables utilized on this first approach have been the access via homepage of the site, the start of a database, the open of a record, the performance of searches, the navigation between records, the direct searches of a record and the change of view of results and records. This initial exploratory approach, based on the between groups linkage clustering method and its square Euclidean distance based intervals, has identified that all entries fulfil the requirements to be included on the analysis. Therefore, the sample for all the clustering processes consists of the entries of all the 4,756 virtual visitors to the database section of the website of the Pitt Rivers Museum during the twelve months span. The obtained dendrogram identifies four main groups with remarkable significance at different levels. Consequently, these results will be translated into the further analyses and, thus, the number of clusters for the K-means analysis has been delimited to four.

Figure 12: Miniature of the dendrogram obtained from the hierarchical clustering process of 4,756 entries

K-means clustering

Once the number of groups has been identified, the K-means analysis is carried out with a maximum limit of four clusters. The same variables as in the hierarchical analysis have been chosen also for this clustering process, namely, the access via homepage of the section, the start of a database, the open of a record, the performance of searches, the navigation

between records, the direct search of a record and the change of viewing template. All these variables respond to the aim of finding different groups of virtual visitors according to their real use of the resources of the database section of the website of the Pitt Rivers Museum.

In order to proceed with the clustering analysis, some technical specifications have been introduced. As mentioned before, the number of clusters has been set to four. Similarly, the input to specify the maximum number of iterations allowed is ten. The process, however, has been stopped during the fourth iteration, because at this stage the maximum change of absolute coordinates for any centre is .000. Before this process has been performed, the minimum distance between initial centres of the clusters was 2.000. After the whole iteration process, conversely, the distance of the final cluster centres have been modified and are as follows.

Table 167
Distance between final cluster centres

Cluster	**1**	**2**	**3**	**4**
1		1.657	1.716	1.158
2	1.657		1.132	1.885
3	1.716	1.132		2.100
4	1.158	1.885	2.100	

Subsequently, an ANOVA analysis has been performed to identify the differences of the weight of each variable in the clustering process. The top optimum limit of significance for each variable has been delimited to .05. All the selected variables for this analysis fulfil this minimum requirement, because all of them present a significance value of .000. Consequently, in this clustering process, all the introduced variables have a high significance degree.

Table 168
ANOVA

		F	**Sig.**
Variables	Access via home	32,870.492	.000
	Start database	25,751.752	.000
	Open record	17,680.128	.000
	Performance of searches	35,112.029	.000
	Navigation between records	770.190	.000
	Direct search of a record	11,639.740	.000
	Change of the viewing option	705.492	.000

Once the whole clustering process has been performed according to the previously mentioned criteria, the number of cases on the generated clusters varies greatly. In absolute values, the cluster labelled as one comprises a total of 3,004 cases, representing by far the most numerous one, with a difference of more than 2,000 entries regarding the second biggest group. Actually, cluster number four consists of 891 entries, followed by cluster with 733 ones. Lastly, cluster labelled as two is the least numerous one, because it has merely 128 entries of the total sample. On the other hand, in relative values, cluster number one represents more than three fifths, while the second one is the cluster labelled as four, representing less than a fifth of the total sample. Finally, cluster number three comprises 15.4 per cent of the cases and cluster two is the one with the lower quantity, because it embraces only 2.7 per cent of the sample. Consequently, the distribution of cases in the different clusters is very irregular, with merely one representing around the double of the sum of the other two clusters.

Table 169
Number of cases in each cluster and percentage

		N	%
Cluster	1	3,004	63.2
	2	128	2.7
	3	733	15.4
	4	891	18.7
	Total	4,756	100.0

After having placed each case into its corresponding cluster, the research identifies the main characteristics of each group. Analysing the geographical origin of the virtual users of the section of the databases of the website of the Pitt Rivers Museum by cluster, in all of them Europe is the continent with the highest presence, but with a highly variable degree. In the case of clusters one and three, European visitors represent three quarters of the whole sample (74.2 and 75.3 respectively), but they represent three fifths of the number two (61.7) and even less of the half (48.0) of the cluster labelled as three. The same pattern can be identified when dealing with British visitors, because they are more than half in the cluster number one (56.6) and nearly three fifths in number four (59.7), but just over a third in clusters two (38.3) and three (35.1). In this last two clusters, moreover, American visitors represent a very similar percentage, being in the case of cluster three (37.2) even two percentage points above the British ones. Among the cases of the rest of the countries, Germany presents a very specific pattern, because in all the clusters German visitors

represent 2.5 per cent of the sample, except for cluster two, where their presence increases to a more significant 16.4 per cent of the total visitors.

Table 170
Percentage of geographical origin of the visitors by cluster

	Cluster 1 %	Cluster 2 %	Cluster 3 %	Cluster 4 %
Europe	74.2	61.7	48.0	75.3
- United Kingdom	56.5	38.3	35.1	59.7
- France	3.0	6.3	1.8	2.9
- Germany	2.5	16.4	2.5	2.5
- The Netherlands	1.8	.0	1.1	1.9
- Italy	1.8	.0	.8	1.6
North America	16.9	34.4	39.6	16.5
- USA	13.9	34.4	37.2	12.5
- Canada	2.7	.0	2.0	3.8
Oceania	4.1	1.6	3.0	4.7
- Australia	2.7	.8	2.0	2.9
- New Zealand	1.0	.8	.5	1.5
Asia	3.3	2.3	7.5	2.8
South America	.8	.0	1.0	.4
Africa	.7	.0	.7	.2
Satellite	.0	.0	.1	.0
N/A	.0	.0	.1	.0

Looking at the relationship between geographical origin and affiliation to cluster from the other perspective, all the geographical areas have most of their visitors into cluster one. Anyway, percentages vary from three fourths of Africa to around half in North America. The other areas, except for Asia (54.4), score around two thirds in this cluster. American visitors, taken separately, are the only ones whose half of the sample is not represented in cluster one. Cluster two is the one with the lowest representation of all the geographical areas. Regarding cluster three, visitors from Asia (30.2) and North America (29.3) double the general pattern explained previously (15.4) of presence in this group. Taken individually, a third of American visitors are inserted in this cluster. Finally, visitors from Oceania (22.3) and Europe (20.2) are also above the mean in cluster four (18.7). In this case, British visitors are over the mean separately considering them, because more than a fifth of them (21.0) are present in this cluster.

Table 171
Affiliation to clusters by geographical origin of the visitors

	Europe (UK)	North America (USA)	Oceania	Asia	South America	Africa	Satellite
Cluster 1	66.9 (66.9)	51.4 (49.4)	64.9	54.4	69.4	75.0	50.0
Cluster 2	2.4 (1.9)	4.4 (5.2)	1.1	1.6	0.0	0.0	0.0
Cluster 3	10.6 (10.1)	29.3 (32.3)	11.7	30.2	19.4	17.9	50.0
Cluster 4	20.2 (21.0)	14.9 (13.1)	22.3	13.7	11.1	7.1	0.0

Regarding the type of visitor, in all the clusters private ones represent the largest group by far. In fact, in cluster two (90.6) and three (90.2) they represent more than nine tenths of the sample, in cluster one more than four fifths (84.8) and in cluster four nearly three quarters (73.4). Due to this fact, the representation of other types of users among the sample of each cluster only reaches values above a tenth in the case of universities or higher education centres in clusters labelled as one (12.3) and four (23.2). In this last case, moreover, even though included into the previously mentioned percentage, more than a tenth of the sample (12.1) are visitors accessing the database from the University of Oxford. The rest of types of users do not score significant values.

Table 172
Percentage of type of visitor by cluster

	Cluster 1 %	Cluster 2 %	Cluster 3 %	Cluster 4 %
Private visitor	84.8	90.6	90.2	73.4
University, higher education centres	12.3	6.3	6.2	23.2
- University of Oxford	3.6	.8	1.6	12.1
Education and learning centres and networks	1.9	2.3	2.2	1.7
Public or governmental institutions	.7	.8	.7	1.0
Means of communication	.1	.0	.1	.3
Museums	.1	.0	.0	.1
Other	.1	.0	.1	.2
N/A	.0	.0	.4	.0

Analysing this relation the other way round, all the different types of visitors are mainly represented in cluster one with percentages around three fifths of the whole sample, except for the means of communication with exactly half of the sample. Visitors from the University of Oxford, separately considered, have less than half of their sample in this cluster (47.2). Looking at cluster two, all the types have a very low representation. In cluster three, conversely, all types of visitors have a representation above twelve percentage point,

except for universities or higher education in general (7.3) and University of Oxford ones in particular (5.2). Conversely, in the case of cluster four, apart from the means of communication (37.5), these two types of visitor represent the highest values, because a third of visitors from universities and higher education centres (32.9) are present in this last cluster and nearly half of the ones from the University of Oxford (47.2). In fact, the same percentage of visitors from the University of Oxford is present in cluster one and four.

Table 173
Affiliation to clusters by type of visitor

	Private visitor	University, higher education centres (University of Oxford)	Education and learning centres and networks	Public or governmental institutions	Means of communication	Museums	Other
Cluster 1	64.0	58.5 (47.2)	62.2	59.5	50.0	75.0	50.0
Cluster 2	2.9	1.3 (0.4)	3.3	2.7	0.0	0.0	0.0
Cluster 3	16.6	7.3 (5.2)	17.8	13.5	12.5	0.0	16.7
Cluster 4	16.4	32.9 (47.2)	16.7	24.3	37.5	25.0	33.3

Taking a closer look at the minimum duration of the visits to the database section of the website of the Pitt Rivers Museum, differences are clearly identifiable. Cluster number one concentrates most of the users in the time span between 11 and 300 seconds, with more than two fifths of the users (43.8) spending between 11 and 60 seconds and above other third (35.5) between 61 and 300 seconds. In cluster number two, conversely, there is a greater diversity regarding the minimum total duration of the visits. A tenth of the sample (10.2) spends a second on the section, another fourth (25.7) between 301 and 1200 seconds and a fifth (20.3) between 3601 and 7200 seconds. On the other hand, cluster number three is the group with the shorter total minimum duration of visits, because nearly ninety per cent (88.2) spend at most a minimum of 30 seconds on the section. Finally, cluster number four concentrates most of the users in minimum durations between 121 and 3600 seconds. Actually, nearly two fifths spend between 121 and 600 seconds (39.6), a fifth between 601 and 1200 (20.8) and another fifth between 1201 and 3600 seconds (22.7). So, the diversity on the total seconds spent by users in the different clusters is evident.

Table 174
Percentage of seconds spent on the database by the users in interval by cluster

	Cluster 1 %	Cluster 2 %	Cluster 3 %	Cluster 4 %
1	.0	10.2	34.2	.0
2-10	2.1	5.5	43.5	.0
11-30	26.5	7.8	10.5	.3
31-60	17.3	5.5	2.6	.6
61-120	17.4	7.0	1.9	5.6
121-300	18.1	7.0	1.2	19.3
301-600	9.1	10.9	1.9	20.3
601-1200	5.4	14.8	1.8	20.8
1201-1800	2.2	.8	.5	9.9
1801-3600	1.6	3.1	.7	12.8
3601-7200	.3	20.3	.8	6.2
7201-10800	.0	6.3	.1	2.2
10801-14400	.0	.8	.0	1.1
14401-18000	.0	.0	.0	.3
+18000	.0	.0	.1	.6

Apart from obvious differences on the total sum of minimum seconds spent on the database section, which is also influenced by the total number of visitors in each cluster, the lowest value for the minimum duration differs by cluster, because in clusters two and three it is 1, while in cluster one is 5 and in cluster four 14. The highest value in each cluster varies from the 11,450 seconds in cluster two to 30,256 in cluster four. Also the mean of minimum total duration of visits per user ranges from 133 seconds in cluster three to 1,984 seconds in cluster two. In fact, the mean durations of visits in cluster two and four (1,608 seconds) are more than ten times higher than the smallest one.

Table 175
Main features of the minimum duration of the visits to the database section in seconds by cluster

	Cluster 1 N	Cluster 2 N	Cluster 3 N	Cluster 4 N
Sum of the total minimum durations of visits	717,575	253,947	97,205	1,432,842
Lowest value of minimum duration	5	1	1	14
Highest value of minimum duration	12,902	11450	21513	30256
Mean of minimum duration	239	1984	133	1608

Concerning the main features by cluster, there are also different patterns of use. The F values of these main options to be performed on the database section vary. In fact, the highest value is reached by the performance of searches with 35,112.029, followed by the access via home with 32,870.492. The start of a database scores 25,751.752, the open of a record 17,680.128 and the direct search of a record 11,639.740. Finally, navigation between records and the change of the viewing option present the lowest values with 770.190 and

705.492 respectively. Cluster one is composed by users who in almost all the cases access to the homepage (99.9), start a database (99.7), open a record (99.2) and search a database (100.0), but only a tenth navigates between records (10.1) and none searches directly for a record. Conversely, users from cluster number two do not access via homepage, but more than a third searches on a database (35.2), a fourth search directly for a record (25.0) and open a record (24.1), less than a fifth per cent starts a database (16.4) and about a tenth change the viewing template (10.9) and navigate between records (9.4). On the contrary, all visitors from cluster number three access to the homepage, but do not perform any other action, because only one out of a hundred starts a database (1.0) or opens a record (1.2). Finally, users in cluster number four are the ones that most extensively make use of the options of the database section, because almost all of them access the homepage (99.7), start a database (99.3), open a record (99.9) and perform searches (100.0), but also other significant part makes use of the other ones, contrarily to what happens on cluster one. Actually, more than nine tenths direct search a record (92.9), nearly two thirds navigate between records (64.8) and above two fifths change the view of records and results (44.2). This last option is the only one not used by at least half of the sample of this cluster. Therefore, when dealing with the main actions on the database, there are significant differences between users in different clusters.

Table 176
Percentage of the main actions on the database by cluster

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	
	%	%	%	%	F value
Access to homepage	99.9	.0	100.0	99.7	32,870.492**
Start of databases	99.7	16.4	1.0	99.3	25,751.752**
Open of a record	99.2	24.2	1.2	99.9	17,680.128**
Search database	100.0	35.2	.0	100.0	35,112.029**
Navigation between records	10.1	9.4	.1	64.8	770.190**
Direct search	.0	25.0	.3	92.9	11,639.740**
Change of view	2.0	10.9	.3	44.2	705.492**

Note: * Significance ≤ .05 ** Significance ≤ .01

The further specific analysis of the options of the section of the database will be performed only taking into account visitors making use of the option treated in each case. Looking at the features of the specific access via home, there are also significant differences in terms of maximum and mean frequencies and numbers by visitor in each cluster. The maximum frequency of access in cluster one is eight, in cluster four 29 and in number three 152. Similarly, the mean frequency of accesses varies from 1.1 in cluster one to 2.3 in cluster three. Regarding the number of accesses, cluster one presents the lowest maximum number

of accesses with a value of thirty and cluster three the highest one with 208. In relation to the mean number of accesses, cluster one presents the lowest value with 2.2, but in this case the highest one is 4.9 in cluster four.

Table 177
Main features of the access via home to the database section by cluster

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
	N	N	N	N
Total sum of frequency of access	3279	0	1691	1594
Maximum frequency of access	8	0	152	29
Mean frequency of accesses	1.1	.0	2.3	1.8
Total sum of number of accesses	6647	0	2119	4323
Maximum number of accesses	30	0	208	54
Mean number of accesses	2.2	.0	2.9	4.9

Analysing the start of a database, both in the case of the maximum and mean of frequencies and number of the option, cluster number three presents the lowest values. The maximum frequency of starts in cluster three is one and the mean 1.0, while the highest ones in frequency is 26 in cluster four and, regarding the mean, 3.9 in cluster two. Concerning the absolute values, the maximum number of starts is two in cluster three, but the highest of all takes place in cluster four with 74 starts. When looking at the means, they vary from 1.1 in cluster three to 5.4 in cluster two.

Table 178
Main features of the start of a database by cluster

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
	N	N	N	N
Total sum of frequency of starts	3223	82	7	1541
Maximum frequency of starts	7	22	1	26
Mean frequency of starts	1.1	3.9	1.0	1.7
Total sum of number of starts	4825	113	8	3814
Maximum number of starts	30	30	2	74
Mean number of starts	1.6	5.4	1.1	4.3

Taking a closer look at the open of a record by cluster, in terms of frequency, there is a very specific pattern, because the lowest number is three in cluster three and the highest one 35 in cluster four, but minimum and maximum means take place in cluster one and two with 1.1 and 2.6 respectively. Looking at the maximum number of opens, the lowest value is seven and takes place in cluster three, but in terms of mean it is 2.5 in cluster one. Both the maximum number and mean of opens of a record take place in cluster four, with values of 165 and 8.3 in each case.

Table 179
Main features of the open of a record by cluster

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
	N	N	N	N
Total sum of frequency of opens	3210	80	13	1532
Maximum frequency of opens	7	29	3	35
Mean frequency of opens	1.1	2.6	1.4	1.7
Total sum of number of opens	7343	224	26	7408
Maximum number of opens	87	75	7	165
Mean number of opens	2.5	7.2	2.9	8.3

Leaving aside cluster three, because its members do not perform searches, cluster one presents the lowest maximum and mean frequency of searches by user, with respective values of seven and 1.1. The highest maximum number of frequency takes place in cluster four with 33 searches, whilst the maximum mean is 2.3, scored by cluster two. Related to the number of searches, the lowest value of the maximum number of searches is 31 in cluster two and the lowest mean 1.7 in cluster one. Cluster four, on the other hand, scores the highest values in both cases with 87 and 5.0 respectively.

Table 180
Main features of the searches on the database section by cluster

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
	N	N	N	N
Total sum of frequency of searches	3231	105	0	1555
Maximum frequency of searches	7	21	0	33
Mean frequency of searches	1.1	2.3	.0	1.8
Total sum of number of searches	5170	149	0	4474
Maximum number of searches	36	31	0	87
Mean number of searches	1.7	3.3	.0	5.0

Regarding the navigation between records, cluster three presents only one case and will not be analysed as the rest. In terms of frequency, the lowest maximum takes place in cluster one with a value of four and the highest one in cluster four with eleven. The same pattern applies to the mean frequency of navigation, because cluster one has a frequency of 1.1 and cluster four of 1.4. When dealing with the number of pages viewed, the minimum absolute and mean values are the ones of cluster two, with 55 pages and 8.1 per visitor respectively. Cluster four, on the other hand, represents the highest values with a maximum of pages viewed by a single visitor of 1,876 and a mean of 69.6 pages per visitor.

Table 181
Main features of the navigation between records on the database section by cluster

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
	N	N	N	N
Total sum of frequency of navigation	321	16	1	782
Maximum frequency of navigation	4	5	1	11
Mean frequency of navigation	1.1	1.3	1.0	1.4
Total sum of number of pages viewed	9460	97	227	40,155
Maximum number of pages viewed	681	55	227	1,876
Mean number of pages viewed	31.1	8.1	227.0	69.6

Dealing with the direct searches of the records, cluster one and three are not analysed due to their low amount of cases making use of this option. The maximum frequency of direct searches in clusters two and four are three and seven and their mean frequencies 1.1 and 1.2. Differences become greater if the number of direct searches is analysed, because in cluster two the maximum by a single visitor is eight and in cluster four 221. Similarly, also the mean number of direct searches shows a significant difference from the 1.8 of cluster two to 7.8 of cluster four.

Table 182
Main features of the direct searches on the database section by cluster

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
	N	N	N	N
Total sum of frequency of direct searches	0	35	2	949
Maximum frequency of direct searches	0	3	1	7
Median frequency of direct searches	.0	1.0	1.0	1.0
Total sum of number of direct searches	0	58	4	6445
Maximum number of direct searches	0	8	2	221
Mean number of direct searches	.0	1.8	2.0	7.8

Finally, when dealing with the change of viewing template of the records and results of searches, cluster three does not present a significant amount to be analysed. Cluster one is the group of visitors with the lowest maximum frequency with a value of one and also the lowest mean with 1.0. The highest maximum frequency is four in both clusters two and four, but the highest mean takes place in cluster two with 1.4. Regarding the maximum number of changes of view, the lowest value takes place in cluster two with seven, while the highest one, which is 91, is scored in cluster four. The mean of the number of changes also shows its highest values in cluster four, with 4.1, but the lowest one is scored in cluster one, with 2.1 changes per visitor making use of the option.

Table 183
Main features of the change of view of the records by cluster

	Cluster 1 N	Cluster 2 N	Cluster 3 N	Cluster 4 N
Total sum of frequency of change view	60	19	2	454
Maximum frequency of change view	1	4	1	4
Mean frequency of change view	1.0	1.4	1.0	1.2
Total sum of number of change view	124	36	4	1619
Maximum number of change view	8	7	3	91
Mean number of change view	2.1	2.6	2.0	4.1

After having analysed the main characteristics of each cluster, there are different models of use of the database section of the Pitt Rivers Museum by virtual visitors.

- Firstly, cluster number one groups users who make extensive use of the access to the homepage, the start of a database, the open of a record and the performance of searches, but a very low navigation between records and an insignificant or inexistent use of the other ones.
- The second cluster comprises users who do not access the database section via the homepage and the use of the options of the database is not extensive, with the performance of searches being the most popular one.
- Cluster number three, conversely, is the one that consists of users accessing the database via the homepage and practically not making use of any of the other options.
- Finally, cluster number four is the one where visitors make use of all the options extensively. In fact, the access via homepage, the start of a database, the open of a record and the performance of searches is present in nearly all visitors, the direct search of a record in most of the cases, the navigation between records in a majority of the cases and the change of view in some less than half of the members of the group.

Table 184
Summary of the cluster definition

	Cluster one	Cluster two	Cluster three	Cluster four
Access to homepage	Total	Inexistent	Total	Total
Start of a database	Total	Not relevant	Insignificant	Total
Open of a record	Total	Significant	Insignificant	Total
Performance of searches	Total	Significant	Inexistent	Total
Navigation between records	Not relevant	Not relevant	Insignificant	Extensive
Direct search of a record	Inexistent	Significant	Insignificant	Nearly total
Change of view	Insignificant	Not relevant	Insignificant	Significant
Identification of cluster	General actions visitors	Indirect visitors	Merely accessing visitors	Extensive deeper visitors

Consequently, according to these results, four different archetypical models of visitors to the database section of the website of the Pitt Rivers Museum, labelling them as general actions visitors for cluster one, indirect visitors for cluster two, merely accessing visitors for cluster three and extensive deeper visitors for cluster four. Therefore, different models of visitors have been identified within the users of the database section on the website of the Pitt Rivers Museum.

Factorial analysis

In addition to the clustering process of the visitors, a factorial analysis has been performed in order to identify and delimit possible factors that drive the previous grouping. As the general behaviour of the visitors has been analysed, the main actions on the database section have been included into the factorial analysis, namely, the access via homepage, the start of a database, the open of a record, the performance of searches, the navigation between records, the direct search of a record and the change of the viewing template of records and results. In order to proceed with the factorial analysis, some technical statistical specifications have been explicated. The initial approach made by means of the scree plot suggests the optimum maximum existence of two factors, which has been established as the maximum limit for the statistical analysis. Similarly, the maximum number of iterations has been limited to 25. Finally, the selected rotation method for the results has been Varimax and the extraction performed using the principal components analysis.

After the delimitation of the statistical specifications, the adequacy of the factor has been tested by means of a Kaiser-Meyer-Olkin (KMO) test and a Bartlett's test of sphericity. The value obtained from the KMO test is .762, which identifies the adequacy of the sample to be used for a factorial analysis. Additionally, the value obtained from the Bartlett's test of sphericity is .000, denoting the non-existence of correlation among initial variables and their suitability for a factorial analysis.

Table 185
KMO and Bartlett's Test.

Kaiser-Meyer-Olkin measure of sampling adequacy		.762
Bartlett's test of sphericity	Approx. Chi-Square	24,852.286
	df	21
	Significance	.000

The next stage of this factorial analysis is the identification of the extracted value of communalities of each selected variable. The initial value of all the variables is one, but the

extracted value of the communalities from the principal component analyses varies according to the reliability of each one. The highest value among these variables is .946 and corresponds to the start of a database. The two next variables with the highest values are the open of a record and the performance of searches, which score .937 in both cases. Apart from these ones, values decrease to .685 in the case of the direct search of a record, to .610 in the one of navigation between records and to .589 in the one of the change of view of the results and records. Finally, the variable with the lowest extracted value is the access via homepage to the database section, with .168 for this analysis.

Table 186
Communalities

	Initial	**Extraction**
Access via homepage	1.000	.168
Start of a database	1.000	.946
Open of a record	1.000	.937
Performance of searches	1.000	.937
Navigation between records	1.000	.610
Direct search of a record	1.000	.685
Change of the view template	1.000	.589

Note: Extraction method – Principal Components Analysis

The principal components analysis has also been used to determine the variance explained by the different components of this analysis. Following the statistical specifications, extraction and rotation of the initial values have been performed with the two components whose eigenvalue is higher than 1.000. These two components individually explain at least 24.0 per cent of the total. After the extraction and rotation process, the total percentage of the variance of the two main components explains 69.611 of the total of the sample for this research. The eigenvalue of the first component scores 2.916, explaining 41.652 of the total variance. Similarly, the second component displays an eigenvalue of 1.957 and has an explaining power of 27.959 per cent of the overall variance. Thus, the sum of these two components explains about seven tenths of the sample analysed in this research.

Table 187
Total variance explained

Comp.	Initial eigenvalues			Extraction sums squared loadings			Rotation sums squared loadings		
	Total	% variance	Cumulative %	Total	% variance	Cumulative %	Total	% variance	Cumulative %
1	3.154	45.063	45.063	3.154	45.063	45.063	2.916	41.652	41.652
2	1.718	24.548	69.611	1.718	24.548	69.611	1.957	27.959	69.611
3	.904	12.910	82.521						
4	.611	8.728	91.248						
5	.488	6.978	98.227						
6	.076	1.084	99.310						
7	.048	.690	100.000						

Note: Extraction method – Principal Components Analysis

After this first approach to the values of the components identified in this research, the transformation of the components performed gives a higher accuracy to the results of the analysis. The transformation of these components has been done utilizing some specific values for each one. These values are show in the following table.

Table 188
Component transformation matrix

Component	1	2
1	.913	.408
2	-.408	.913

Once the transformation values have been applied on the main components of the factorial analysis, variables have been placed into one of these components. The obtained values[88] denote the weight of each variable in the factor. As explicated on the statistical specifications, values below .400 have been removed from further analysis. Logically, according to its explaining power, variables of the first component are the most powerful ones. In this sense, the start of a database shows the highest value with .961. The performance of searches (.955) and the open of a record (.954) are the other variables that complete the first factor. Second component, on the other hand, comprises other three variables with a lower value than the ones on the first one. In fact, the direct search of a record scores .826, while navigation between records and the change of the viewing option score .773 and .768 respectively. Finally, the access to the database section via homepage does not score a significant value above .400 in neither of the two main components.

[88] Values below the threshold of .400 have been removed from the results.

Table 189
Rotated Component Matrix

	Component 1	Component 2
Start of a database	.961	
Performance of searches	.955	
Open of a record	.954	
Direct search of a record		.826
Navigation between records		.773
Change of the view template		.768
Access via homepage		

Notes: Extraction Method - Principal Component Analysis. Rotation Method - Varimax with Kaiser Normalization. Rotation converged in 6 iterations.

From the obtained results, the research has identified two specific factors, which are clearly structured according to the variables. In this sense, component one deals with the more general actions to be performed on the database section, except for the access via homepage. Therefore, the start of a database, the performance of searches and the open of a record of the database generate the first component in this analysis. The second component, on the other hand, comprises the direct search of a record, the navigation between records and the change of the viewing template of the results and the records. Consequently, these two components can be labelled as the general actions of the database and the more sophisticated actions respectively. Thus, the research has identified that in this analysis cases from this sample can be clustered according to the structures and values of these two components.

4.2.3.4.- Behaviour analysis of different individual profiles

Finally, the last stage of the research focuses on the individual path of some selected virtual visitors to the database section of the website of the Pitt Rivers Museum during the time span between the 26th of October of 2007 and the 25th of October of 2008. Ten IP addresses from the previously explained clusters have been chosen for this final stage. Taking into account that all visitors have been clustered into four groups, the selection has been performed randomly within these groupings. Each cluster has been divided into ten parts and the last IP address of each part selected for further analysis. Therefore, the total sample of virtual visitors analysed in this section consists of 40 cases. The analysis has identified the total number of session, the actions performed and the order of the actions by visitor. Additional origin and type of visitor information is also supplied for each case.

As mentioned on the previous section, the diverse clusters present different characteristics and have been labelled according to them. Visitors from cluster number one make general use of the main actions, whilst cluster two comprises visitors not accessing via homepage of the section. On the other hand, as the label of the groups expresses, visitors from cluster three are merely accessing ones. Finally, cluster four embraces visitors with the most extensive usage patterns. For the further individual analysis, visitors have been grouped on the basis of these criteria.

Regarding cluster one, visitor number one has been identified as a private user accessing from the United Kingdom. This visitor carries out two different sessions during November 2007. During the first visit, which lasted a minimum of ten seconds, the visitor started at the homepage of the section and then started the objects database to perform a search and open one of the records of the results. The second session, on the other hand, presents a different pattern, because the visitor started searching in the objects database and, after that, a record was opened. This second session, which can be assimilated also into cluster two, lasted at least seven seconds. As the clustered elements are the visitors and not the visits, this case has been placed into cluster one. In total, this user spent a minimum of seventeen seconds in the section of the database.

Visitor number two accessed the database section from the United Arab Emirates as a private user. This visitor accessed the section on December 2007 via homepage. After staring the database of the objects and performing a search, the visitor opened a record to finally return to the homepage again. The total minimum duration of this visit is 41 seconds.

Visitor number three of this cluster is a private user from Japan that accessed the section on March 2008 via homepage. This visitor started the objects database and searched in it to open a record afterwards. The last action of this visitor was the access to the homepage, finishing the visit with a total minimum duration of 49 seconds.

Within this cluster, visitor number four has been identified as a private one accessing on December 2007 from the United States. After accessing via homepage, this visitor started and searched in the database of photographs. Finally, this visitor opened a record, finishing the path with a minimum duration of 33 seconds.

A private visitor accessing from the United Kingdom has been labelled as the number five in cluster one. During the visit of September 2008, this visitor accessed the section via homepage and, after starting and searching in the database of photographs, opened four records. Subsequently, the visitor opened the database of objects and preformed a search on it to finally open two records. This total sequence of the visit has a total minimum duration of 99 seconds.

Visitor number six has been identified as a private one accessing from France. This visitor performs two different sessions and, as happens with visitor one of this cluster, the second visit follows the pattern of cluster two. The first visit, performed on December 2007, accessed the homepage twice and then started and searched the objects database. After opening four records, the visitor returned to the homepage, started the objects database and opened a record. After navigating five records, another record is opened. Subsequently, the homepage was opened twice. After starting the database of the objects and searching in it, the visitor opened a record and accessed the homepage. The total minimum duration of this visit is 257 seconds. As mentioned before, the second visit, which took place during December 2007, started with the performance of a search in the objects database and then opened a record. This visit lasted a minimum of nine seconds. The total minimum seconds spent by this visitor on the database section is 263 for this visitor.

Within this cluster one, visitor number seven accessed from the United Kingdom as a private user. On January 2008, this visitor accessed the homepage and started the objects database. Once performed a search in this database, the visitor finished the session, with a minimum total duration of 26 seconds, opening a record.

Visitor number eight, also accessing from the United Kingdom, is a private user, whose single visit takes place on November 2007. Similarly to the previous visitor, the visit started at the homepage. The difference resides in the fact that, after starting the database of objects and performing a search, the visitor opened two records at the end of the visit. The total minimum duration of the visit is 110 seconds.

Another private visitor accessing from the United Kingdom is visitor number nine in cluster one. The single visit, taking place on July 2008, accessed the database via homepage

and started the database of objects. After searching in this database and opening a record, the visitor navigated between records. Before returning to the homepage, the visitor clicked 46 times the next button, one the previous and once again the next one. After the homepage, the visitor started the objects database and performed a search, opening two records. The navigation between records took place again with 106 next record option, a previous one and 45 next again. After returning to the homepage, the visitor started again the database of objects and performed a search. In this case, only one record is opened, but again the navigation between records took place with nineteen next, one previous and 70 next records again. The final stage of this visit accessed the homepage, started the objects database, performed a search and finally opened three records. The total minimum duration of the visit is 893 seconds.

Lastly, visitor ten of cluster one is a private user that accessed from Canada. The single visit, which lasted a minimum of 104 seconds, started in the homepage of the section of the database and subsequently started the database of photographs and performed a search. The visitor opened a record and returned to the homepage. After that, the objects database was opened and a search performed. Finally, the path finished when the visitor opened a record.

Table 190
Summary table of the paths of the visitors selected in cluster one

Visitor	Origin and type		Path of visit and minimum duration
1	UK private	-	(August 2008, 26) Homepage → Start objects → Search objects → Open ***10 seconds***
		-	(November 2007, 2) Search objects → Open ***7 seconds***
2	United Arab Emirates private	-	(December 2007, 13) Homepage → Start objects → Search objects → Homepage ***41 seconds***
3	Japan private	-	(March 2008, 21) Homepage → Start objects → Search objects → Open → Homepage ***49 seconds***
4	USA private	-	(December 2007, 13) Homepage → Start of photos → Search photos → Open ***33 seconds***
5	UK private	-	(September 2008, 20) Homepage → Start of photos → Search of photos → Open *4 → Start of objects → Search objects → Open *2 ***99 seconds***
6	France private	-	(December 2007, 21) Homepage *2 → Start objects → Search objects → Open * 4 → Homepage → Start objects → Open → Next *5 → Open → Homepage *2 → Start objects → Search objects → Open → Homepage → Start objects → Search objects → Open → Homepage ***257 seconds***
		-	(December 2007, 23) Search objects → Open ***9 seconds***
7	UK private	-	(January 2008, 30) Homepage → Start objects → Search objects → Open ***26 seconds***
8	UK private	-	(November 2007, 12) Homepage → Start objects → Search objects → Open *2 ***110 seconds***
9	UK private	-	(July 2008, 20) Homepage → Start objects → Search objects → Open → Next *46 → Previous → Next → Homepage → Start objects → Search objects → Open *2 → Next *106 → Previous → Next *45 → Homepage → Start objects → Search objects → Open → Next *19 → Previous → Next *70 → Homepage → Start objects → Search objects → Open *3 ***893 seconds***
10	Canada private	-	(August 2008, 26) Homepage → Start photos → Search photos → Open → Homepage → Start objects → Search objects → Open ***104 seconds***

The second cluster, as explained on the previous section, comprises users that do not access the database section via homepage. Selected visitor number one of this group accessed the database section from the Oxford University. On the single visit on April 2008, the visitor searched the database of objects and opened four records in a session of a total minimum duration of 524 seconds.

Visitor number two carries out seven different sessions and is identified as a private user accessing from the United Kingdom. The first one comprises a single search in the objects database and its minimum duration is one second. During the other six sessions, that took place between March and April 2008, the visitor consulted the results with respective minimum durations of 1, 86, 38, 74, 44 and 1 second. The return to the results ascended at

most to four times during one session on July 2008. The total minimum amount of second spent by this user in the database section is 245, distributed on the seven mentioned sessions.

Within this cluster, visitor number three, a private user accessing from the United Kingdom, presents a very specific pattern of visits. Between November 2007 and September 2008, a total of twenty visits have been performed with the only action of consulting the results. The number of consults on each visit varies from a single one to twelve consults. The duration of the visits also ranges from one second to 1,681. Adding all the seconds, 4,235 is the total minimum duration of all the visits of this user.

Visitor number four is a private user accessing from Germany. During the visit on November 2007, after consulting the results, the visitor changed four times to the list view. The total minimum duration of the visit is 557 seconds.

Selected visitor number five of cluster two, also a private one accessing from Germany, searched the objects database twice on April 2008 in a single visit that lasted a minimum of 85 seconds.

A private user accessing from the United States has been identified as visitor number six of this cluster. This visitor has performed two different visits with a unique action on each one. During the first visit, taking place on July 2008, the visitor searched a record directly by its ID. On the second one, however, which occurred on October 2008, the direct search was done by the record number. Both visits have a minimum total duration of one second, with a global minimum stay of two seconds by this user on the database section.

Visitor number seven of this cluster has been identified as a private user that accessed from the United States. This visitor, between November 2007 and November 2008, has visited the database section nine times and in all of them performed a unique action with variable degrees of repetition. Actually, this visitor, during all visits, merely opened records in a range from a single one to 17. The minimum duration of each visit also varied from one second to 1,604. In total, the sum of the minimum duration of all the visits of this visitor to the database section of the Pitt Rivers Museum scores 4,193 seconds.

Another private user accessing from the United States has been identified as visitor number eight of the cluster two. This visitor, whose single visit took place on April 2008, accessed the database section making use of the option to see the next record. As this is the only action recorded for this user, the total minimum duration of the visit is one second.

From the sample of cluster two, visitor number nine has been identified as another private user accessing from the United States. From February to October 2008, this visitor accessed the database section three different times. In all of them, the visitor started directly the objects database once, except for the visit on June 2008, where its action is repeated six times. Anyhow, after opening the database, the visit finished in all the cases. Thus the minimum duration of the visits with a single start of the database is one second, whilst for the visit of June 2008 it scores 3,600 seconds. Consequently, globally 3,602 is the total minimum amount of records spent in the database section by this visitor.

Finally, visitor ten of this cluster is a private user that has accessed the Pitt Rivers Museum database from France. During the single visit, taking place on January 2008, this visitor started the session searching in the database of objects and the opened a record as final action. In total, the minimum recorded duration of the visit is ten seconds.

Table 191

Summary table of the paths of the visitors selected in cluster two

Visitor	Origin and type		Path of visit and minimum duration
1	UK Oxford University	-	(April 2008, 28) Search objects → Open *4 ***524 seconds***
2	UK private	-	(February 2008, 17) Search object ***1 second***
		-	(March 2008, 3) Results ***1 second***
		-	(July 2008, 7) Results *4 ***86 seconds***
		-	(July 2008, 9) Results *2 ***38 seconds***
		-	(July 2008, 14) Results *2 ***74 seconds***
		-	(August 2008, 14) Results *2 ***44 seconds***
		-	(August 2008, 18) Results ***1 second***
3	UK private	-	(November 2007, 5) Results ***1 second***
		-	(November 2007, 20) Results *2 ***80 seconds***
		-	(November 2007, 20) Results *9 ***850 seconds***
		-	(January 2008, 20) Results *3 ***101 seconds***
		-	(January 2008, 23) Results *2 ***88 seconds***
		-	(March 2008, 16) Results *12 ***1,681 seconds***
		-	(March 2008, 26) Results *3 ***139 seconds***
		-	(April 2008, 3) Results *6 ***498 seconds***
		-	(April 2008, 3) Results *2 ***57 seconds***
		-	(April 2008, 7) Results *6 ***291 seconds***
		-	(April 2008, 18) Results ***1 seconds***
		-	(April 2008, 20) Results ***1 seconds***
		-	(June 2008, 4) Results *3 ***46 seconds***
		-	(July 2008, 3) Results *2 ***54 seconds***
		-	(July 2008, 7) Results *6 ***112 seconds***
		-	(July 2008, 9) Results *5 ***44 seconds***
		-	(July 2008, 24) Results *8 ***129 seconds***
		-	(July 2008, 24) Results *3 x ***45 seconds***
		-	(August 2008, 18) Results *2 ***11 seconds***
		-	(September 2008, 7) Results *2 ***6 seconds***
4	Germany private	-	(November 2007, 20) Results → List *4 ***557 seconds***
5	Germany private	-	(April 2008, 28) Search objects *2 ***85 seconds***
6	USA private	-	(July 2008, 12) Direct record ID ***1 second***
		-	(October 2008, 23) Direct record number ***1 second***
7	USA private	-	(November 2007, 6) Open *2 ***113 seconds***
		-	(November 2007, 7) Open ***1 second***
		-	(April 2008, 1) Open ***1 second***
		-	(July 2008, 12) Open *5 ***651 seconds***
		-	(July 2008, 12) Open *4 ***960 seconds***
		-	(July 2008, 12) Open *17 ***138 seconds***
		-	(July 2008, 12) Open *16 ***1,604 seconds***
		-	(July 2008, 12) Open *7 ***410 seconds***
		-	(November 2008) Open *4 ***265 seconds***
8	USA private	-	(April 2008, 1) Next ***1 second***
9	USA private	-	(February 2008, 4) Start of objects ***1 second***
		-	(June 2008, 29) Start of objects *6 ***3,600 seconds***
		-	(October 2008, 9) Start of objects ***1 second***
10	France private	-	(January 2008, 8) Search objects → Open ***10 seconds***

Cluster three of users of the database of the website of the Pitt Rivers Museum is composed of visitors that mainly simply access the section, without significantly performing any other action. Consequently, this group shows the simplest pattern of visits.

The selected visitor number one of this group accessed from the Oxford University. During the single visit on May 2008, this visitor accessed three times the homepage and finished the session with a minimum duration of 28 seconds in total.

Visitor number two, on the other hand, is a private user accessing from Hong Kong on July 2008 and merely accessed the homepage. Therefore, the minimum recorded duration of the visit is one second.

Similarly, visitor number three, who accessed as a private user from China, opened the homepage of the section on January 2008, but did not perform any other action. So, the minimum duration of the visit recorded is again one second.

On February 2008, visitor number four, identified as a private user accessing from the United States, opened the homepage of the section and stayed there a minimum of two seconds before finishing the session.

Another private user, accessing from the United States on May 2008, has been selected as visitor number five and repeats exactly the same previous pattern, only staying on the homepage for a minimum of two seconds.

Visitor number six, which is a private user accessing from the United States, opened the homepage of the section on November 2007. The minimum recorded duration of this visit is one second.

On March 2008, visitor number seven accessed from the United Kingdom as a private user the homepage of the database section in a session, whose minimum duration was one second.

A private user that accessed the homepage from Italy has been identified as visitor number eight. On the single visit, taking place during June 2008, the minimum duration of the visit has been of two seconds.

Visitor number nine, identified as a private user accessing from the United Kingdom, opened the homepage of the section on February 2008 for a minimum of one second. No further action is recorded on the logs of this visitor.

Finally, the last visitor of this cluster is a private user accessing from the United Kingdom, whose unique session on July 2008 consists of a visit of a minimum of one second to the homepage of the section.

Table 192
Summary table of the paths of the visitors selected in cluster three

Visitor	Origin and type		Path of visit and minimum duration
1	UK Oxford University	-	(May 2008, 1) Homepage *3 ***28 seconds***
2	Hong Kong private	-	(July 2008, 28) Homepage ***1 second***
3	China private	-	(January 2008, 18) Homepage ***1 second***
4	USA private	-	(February 2008, 15) Homepage ***2 seconds***
5	USA private	-	(May 2008, 14) Homepage ***2 seconds***
6	USA private	-	(November 2007, 28) Homepage ***1 second***
7	UK private	-	(March 2008, 12) Homepage ***1 second***
8	Italy private	-	(June 2008,10) Homepage ***2 seconds***
9	UK private	-	(February 2008, 17) Homepage ***1 second***
10	UK private	-	(July 2008, 5) Homepage ***1 second***

Lastly, cluster four embraces visitors that make extensive use of the different options of the database section. Within the sample of this cluster, visitor number one has been identified as a user accessing from a university of the United Kingdom. This visitor has performed a single visit to the database section on December 2007, accessing the section via the homepage. Once there, the visitor started and searched in the database of the photographs, opening a record. After it, the visitor started and searched the database of the photographs again and opened a record. Subsequently, this visitor searched directly four records by their number and opened the last of them. Afterwards, during the same visit, the user started the database of the photographs and searched in it. Once opened a record, the visitor started again the database of photographs, searched in it and opened a record. After this process, the visitor accessed the homepage and repeated the process of starting and searching in the database of photographs, as well as opening a record. Finally, after direct searching by the record number twice, the visitor accessed the homepage of the section twice before finishing the session. In total, the minimum duration of the visits is 941 seconds.

Visitor number two, on the other hand, is a user accessing from Oxford University during December 2007. After accessing the database section via homepage, the visitor started the

database of the photographs and searched in it. Two records are opened after the search and then the homepage of the section is accessed before starting the photographs database and searching in it. The visitor opened a record and, after using the table viewing template, searched for a record directly by its number. The table viewing template is selected again before opening a record. After returning to the homepage, the visitor started the database of photographs, searched in it and finally opened two records. This whole process has a minimum total duration of 268 seconds.

Consequently, visitor number three is a recurrent visitor that has accessed the database section four times during the delimited time span. This visitor has accessed the section from a centre or a network of education and learning from the United Kingdom. During the first visit, which took place on December 2007, the visitor accessed the homepage, started the objects database and searched in it. After opening three records, the visitor finished the visit returning to the homepage. This visit lasted a minimum of 91 seconds. The second visit took place on January 2008, starting at the homepage of the section. Once the objects database is started and a search performed, the visitor opened a record and subsequently accessed the homepage twice. Subsequently, the visitor started the database of objects, performed a search and opened two records, before returning finally to the homepage. This session has a minimum recorded duration of 196 seconds. The third session took place on April 2008 and the first action was the access to the homepage. After starting and searching in the database of objects, the visitor opened a record and then searched directly by their record number three times. After the last direct search, the navigation between records utilized four times the next option and then searched by number a record directly. Once again, the visit finished at the homepage with a minimum duration of 165 seconds. The last session of visitor three of this cluster was carried out on April 2008. After accessing the homepage, the visitor opened the database of objects and performed a search in it. The final stage of this visit was the opening of a record, which took place 16 seconds after the initial action of this session. Summing all the minimum amounts of the four visits, the total minimum number of seconds spent in the database section is 462 for this specific visitor.

Visitor number four of this cluster is a private user that accessed from New Zealand. The single visit of this user took place on June 2008 and started with an access to the homepage of the section. Once the objects database is opened and a search performed, the visitor

opened two records and, subsequently, searched directly two records by their number. After navigating to the next and the previous record, the visit finished with the selection of the list view template by the visitor. The minimum recorded duration of this visit is 458 seconds.

A private user accessing from the United States has been selected as visitor number five. During the single visit on April 2008, this visitor accessed the homepage of the section, started the objects database and performed a search. Once a record is opened, the visitor changed the viewing template to table and list respectively. After searching for a record by its ID, the list option is selected again to change it to table afterwards. The visitor opened three records before returning to the homepage and starting the database of photographs. After searching in the database of photographs and opening a record, the homepage is accessed and another search performed in the same database. Finally, the visitor accessed twice the homepage and finished this visit with a minimum duration of 417 seconds.

On the other hand, visitor number six has been identified as a private user accessing from Kuwait. The single visit of this case took place on December 2007. After accessing via homepage, starting the photographs database and performing a search, this visitor opened five records and, after the last one, consulted other three, using the option of viewing the next one. Changed the viewing template to list and navigating to the next record, the visitor searched directly a record by its number. After opening three records, the visitor returned to the homepage to start the photographs database and perform a search. Then, four records were opened before accessing the homepage twice. The start of the database of photographs and the performance of a search preceded the opening of two records and the navigation to twelve next ones. After searching directly a record by its number, the visitor finished the session returning twice to the homepage of the section. This whole process has a minimum recorded duration of 2,393 seconds.

Visitor number seven of this cluster is a private user accessing from the United Kingdom. On November 2007, the single visit of this user started at the homepage of the section. After starting the database of objects and performing a search, the visitor opened a record and subsequently searched directly a record by its number. After consulting 38 next records, the visitor changed the viewing template and consulted other four next records. Then, the visitor returned three times to the homepage and started the objects database.

After the performance of a search, the visit finished with a minimum recorded duration of 1,967 seconds when another record was opened.

The single visit of visitor number eight, conversely, had a shorter minimum duration of 128 seconds. This private user, accessing from the United Kingdom, accessed on December 2007 the homepage twice before starting the database of photographs. After performing a search, the visitor opened a record and then searched directly twice records by their number. Once opened the record, the visitor returned to the homepage. The start and search in the objects database preceded the final action of the visit, which is the open of a record.

Another private user accessing from the United Kingdom has been selected as the visitor number nine of this cluster. During the single visit, which took place on August 2008, the user accessed the homepage. After starting the database of photographs and performing a search, the visitor opened five records and returned to the homepage twice. Once the objects database is started and another search performed, three records were opened. After returning to the homepage, starting the database of the photographs and the performance of a search, another record was opened. This last sequence was integrally repeated. The return to the homepage precedes the start of the database of objects and the open of two records. Once again, the visitor returned to the homepage to start and search in the database of objects. After opening a record, there were three direct searches of records by number. The return to the homepage twice took place before the start of the database of objects and the performance of a search that preceded the open of a record. After another return to the homepage, objects database is searched before a record was opened. Subsequently, the visitor returned twice to the homepage and later on started the database of photographs to perform a search. After the open of a record, the navigation between records took place consulting nine next records and five previous ones. After starting the results, another next record was consulted and opened. The final return to the homepage was the previous action to the start and search in the database of objects. Finally, the open of a record was followed by the navigation to the next three records. This complex visit scores a total amount of 894 seconds as the minimum recorded duration.

Lastly, the final selected visitor of this fourth cluster is represented by a private user accessing from Canada. The single session of this visitor took place during May 2008 and

started at the homepage of the section. After starting the database of objects and performing a search, the visitor opened a record. Then, the consult of the three next records was preceded by two direct searches by record number. This action of direct searching a record by number is repeated once. The final stage of the visit was the navigation between records, with the consult of twenty next records, a previous one and once again another twenty next ones. The minimum recorded duration of this visit scores 1,961 seconds.

Table 193
Summary table of the paths of the visitors selected in cluster four

Visitor	Origin and type		Path of visit and minimum duration
1	UK university	-	(December 2007, 11) Homepage → Start photos → Search photos → Open → Start photos → Search photos → Open → Direct record number *4 → Open → Start photos → Search photos → Open → Start photos → Search photos → Open → Homepage → Start photos → Search photos → Open → Direct record number *2 → Homepage *2 ***941 seconds***
2	UK Oxford University	-	(December 2007, 6) Homepage → Start photos → Search photos → Open *2 → Homepage → Start photos → Search photos → Open → Table → Direct record number → Table → Open → Homepage → Start photos → Search photos → Open *2 ***268 seconds***
3	UK education and learning networks	-	(December 2007, 14) Homepage → Start objects → Search objects → Open *3 → Homepage ***91 seconds***
		-	(January 2008, 21) Homepage → Start objects → Search objects → Open → Homepage *2 → Start objects → Search objects → Open *2 → Homepage ***196 seconds***
		-	(April 2008, 4) Homepage → Start objects → Search objects → Open → Direct record number *3 → Next *4 → Direct record number → Homepage ***165 seconds***
		-	(April 2008, 30) Homepage → Start objects → Search objects → Open ***10 seconds***
4	New Zealand private	-	(June 2008, 1) Homepage → Start objects → Search objects → Open *2 → Direct record number *2 → Next → Previous → List ***458 seconds***
5	USA private	-	(April 2008, 7) Homepage → Start objects → Search objects → Open → Table → List → Direct record ID → List → Table → Open *3 → Homepage → Start photos → Search photos → Open → Homepage → Search photos → Home *2 ***417 seconds***
6	Kuwait private	-	(December 2007, 3) Homepage → Start photos → Search photos → Open *5 → Next *3 → List → Next → Direct record number → Open *3 → Homepage → Start photos → Search photos → Open *4 → Homepage *2 → Start photos → Search photos → Open *2 → Next *12 → Direct record number → Homepage *2 ***2,393 seconds***
7	UK private	-	(November 2007, 4) Homepage → Start objects → Search objects → Open → Direct record number → Next *38 → List → Next *4 → Homepage *3 → Start objects →

			Search objects → Open ***1967 seconds***
8	UK private	-	(December 2007, 17) Homepage *2 → Start photos → Search photos → Open → Direct record number *2 → Open → Homepage → Start objects → Search objects → Open ***128 seconds***
9	UK private	-	(August 2008, 10) Homepage → Start photos → Search photos → Open *5 → Homepage *2 → Start objects → Search objects → Open *3 → Homepage → Start photos → Search photos → Open → Homepage → Start photos → Search photos → Open → Homepage → Start objects → Open *2 → Homepage → Start objects → Search objects → Open → Direct record number *3 → Homepage *2 → Start objects → Search objects → Open → Homepage → Search objects → Open Homepage *2 → Start photos → Search photos → Open → Next *9 → Previous *5 → Sort → Next → Open → Homepage → Start objects → Search objects → Open → Next *3 ***894 seconds***
10	Canada private	-	(May 2008, 12) Homepage → Start objects → Search objects → Open → Direct record number *2 → Next *3 → Direct search number → Next *20 → Previous → Next *20 ***1,961 seconds***

Consequently, also attending to the paths of visit of the selected users, the general patterns identified by the cluster analysis are reaffirmed. Anyhow, selected users one and six from cluster one present a very specific pattern, because, although their first visit can be easily placed into cluster one, the second session shows a path with the characteristics of cluster two. Nevertheless, as visitors and not visits are the clustered elements, these cases are placed into the first group. Globally, the paths of the selected visitors show that there are different types of users, but also that they can be grouped together according to some general similarities of use.

4.2.4.- Validation of the premise

This second part of the research has dealt with the use of the resources made available by museums on the Internet by virtual visitors and their behavioural patterns. As explained before, this part faces the topic from a twofold perspective and, due to this fact, the sample of each part is different. On the one hand, the general weblogs analysis has a sample of three museums that provided the general reports on the visits to their websites, namely the Benaki Museum, the Diocesan and Regional Museum of Lleida and the Pitt Rivers Museum. On the other, the sample for the individual analysis of users consists of 4,756 unique IP addresses that have visited the database section of the Pitt Rivers Museum during the established time frame.

The diverse analytical processes of this part of the research have been carried out to answer to the last premise, namely premise *γ': Users behavioural pattern differs on websites of museums with different character and philosophies and their diverse features*. This general theoretical premise has been translated into two more specific and measurable working null hypotheses. As mentioned on earlier sections, this premise is analysed both taking users of a website into consideration in global terms as well as individually.

In relation to the first part of the premise, this analysis deals with users of each website as a global entity. Considering the different technological implementations of the three museums of the sample for this part of the research, the first null hypothesis states "H_0*5: Global users behave equally on all the websites"*. This hypothesis postulates that global patterns of user behaviour on all the websites are equal, independently from the features available on them. The test of this hypothesis has been performed by a frequencies analysis and a comparison of the general patterns. According to the results, the first difference resides in the amount of users, because, while the Benaki Museum and the Pitt Rivers Museum have a considerable number of virtual visitors, the Diocesan and Regional Museum of Lleida, due to its generic characteristics, has a more limited amount. Analysing the general patterns, there are some similarities and significant differences. In general terms, the longest visit duration takes place during August on the three institutions. Additionally, an inverse relation has been identified between the amount of visitors and the duration of the visits. Looking at the pattern of visitors' amount, however, different models have been identified on museums of this sample. While the Diocesan and Regional Museum of Lleida and the Benaki Museum present a seasonal and bi-seasonal pattern, the Pitt Rivers Museum shows a more month related one, probably linked to the academic and research ambit. Therefore, different global usage models have been identified for these three websites. In addition, the same analysis has been performed with the different sections of the website of the Pitt Rivers Museum. In this case, similarities are more common than in the previous case, but there are still some differences on peaks pattern of the different actions by each section of the website. Consequently, being it between websites or the different parts of one of them, there are different global usage patterns of the resources by virtual visitors and, thus, results reject the established null hypothesis and alternatively posit that "*Global users behave differently on websites with different generic characteristics"*.

Regarding the individual analysis of the users, the null hypothesis of this research states *"$H_0$6: Individual users behave equally along the different features provided by museums"*. After having previously identified that the global usage pattern of the different resources of the website of the Pitt Rivers Museum, the research has focused on the specific 4,756 unique IP addresses of the database section. The research initially assumes greater homogeneity on the database section than in any other, because its purpose is clearly academic and research-oriented. Once an initial frequencies' analysis of the main actions of the database and the general characteristics of users has been performed, the research has carried out a clustering process of the entries to identify potential groups of users by their general utilization of the database section of the website. The clustering process has been performed by a hierarchical cluster, a K-means cluster and a factorial analysis. Results have identified four different clusters. These four clusters group, with a variable degree, all the IP addresses that visited the database section during the established time span. According to the analysis of the actions of each group, clusters have been labelled as general actions visitors, indirect visitors, merely accessing visitors and extensive deeper visitors respectively. Moreover, the performed factorial analysis has identified that two main components drive the clustering process of the current sample. Consistent with the variables of each component, they have been identified as general actions on the database and more sophisticated actions. Additionally, an individual path analysis of visitors from each cluster has reaffirmed the previous findings. All these different operations support the rejection of the null hypothesis and the research states that *"Individual users behave differently along the different features provided by museums and within them"*.

Summing up, this section of the analysis has tested the last premise of the research. These findings support that the premise *γ': Users behavioural pattern differs on websites of museums with different character and philosophies and their diverse features* is suitable to analyse the use by virtual visitors of the web features implemented by museums to communicate their digital cultural contents.

Section 5.- Conclusions and further implications

5.1.- Context and conclusion of the thesis

History of humankind has been accompanied by technological development since the very beginning. During recent times, however, the speed of technological development has increased exponentially. From the development of the Internet on, moreover, technologies have gradually been introduced in different domains of daily life activities. Beginning from the economic ambit, technologies have been influencing human activity, fostering the establishment of the so-called Knowledge Society. Along with the technological development, this original socio-technological juncture is embedded in the new Knowledge Society paradigm. Not only technologies are changing, but also the functioning schemes and mental structures of the individuals. This attitudinal and behavioural transformation, similarly, has been recently backed by the massive implantation of technologies based on the 2.0 approach. Technological applications are more user-oriented than ever before. Users have greater power of communication among individuals in social networks and the instantaneity and reach of communication has opened up new opportunities for cultural institutions. In other words, technologies may facilitate the empowerment of citizens.

Additionally, from an economic point of view, the cultural sector has become a significant part of current productive processes. However, recently a new approach has been developed, labelling the sector as Cultural and Creative Industries (CCI). According to this recent approach, CCI have become a major part of the economy of the developed

countries. These industries, which include more than the mere traditional core cultural activities, embrace creative aspects in all their processes. In this sense, creativity and innovation have become central to cultural production and distribution processes in the competitive global market of the Knowledge Society. Aware of this fact, political institutions are conscious of an appropriate planning of the sector and its optimal adaptation to the current situation. Evolving from the traditional models, cultural policies, on their aim of planning for culture, have evolved designing policies that intertwine cultural processes, the implementation of technologies and the extensive use of creativity. A clear example of this phenomenon is the European Union, whose cultural policies aim at becoming Europe the leading knowledge based global economy.

Museums are still one of the main traditional cultural institutions and preservers of the collective memory. From the perspective of key cultural institutions, museums have evolved together with social and historical processes. These cultural institutions have evolved from the elitist, evolutionist and unidirectional didactic perspective to a more open, innovative and multilateral communicative one. From the Modern Ages, museums have maintained their educational role in society, but their philosophy of communication of the contents to the audience has changed considerably, gathered for academic purposes into four different theoretical archetypical models.

In this general context, the implementation of technologies has improved management and communication processes of cultural institutions. Web features have fostered new ways of communication with virtual audience, but also pose new challenges. Therefore, museums are facing these new challenges to communicate contents on these technologically mediated environments. Time and space constraints have been blurred in favour of a more global and constant access to contents on the web. New opportunities for more instantaneous ways of communication are likewise taking place in many institutions, fostering a more direct communication with the audience. Furthermore, technological applications provide museums with the possibility to present additional information that complement the current contents on the physical institutions, as well as to digitally present more content than the one fitting into the physically displaying space. Consequently, if an optimal technological implementation is performed, museums have greater communicative power than ever before. Hence, all cultural institutions and museums in particular currently face challenges related to communication of cultural contents in technologically mediated

environments. Thus, it becomes crucial to identify and delimit the philosophy of communication in web environments, as well as the utilization of the digital resources by the virtual visitors of the websites of the museums.

Museums need to be aware of the shortcomings. The overcome of the time and space dimensions allow virtual visitors to access contents of the institutions at their will. Moreover, even contents from different museums can be accessed simultaneously. Therefore, digital visitors can make a more rational use of the contents provided to better meet their needs and expectations. From all the contents communicated by museums, virtual visitors access those that are better adapted to their necessities. Consequently, visitors of the digital realm of the institutions make different utilizations of contents and features displayed by museums on their websites.

Framed in this general context, the research has approached the issue from a twofold perspective, namely, the communication and access ones. First of all, museums have been analysed to enhance their models of philosophy of communication, including differences related to cultural and corporate values. The other analysis perspective pursues a better understand the behaviour of virtual visitors within the new environment of culture in the Knowledge Society. Integrating the results of these two interrelated approaches, the research has shed some light on the issue of culture in the Knowledge Society from the perspective of the digitized museums.

By means of statistical processes, the obtained results have provided some light to the posed research questions regarding the use of web technologies to communicate and access cultural contents of museums. Attending to the core philosophies of communication, the research supports that there are diverse degrees of implementation of the web features. Most of the analysed websites make use of static web features, still embedded into the 1.0 web philosophy structures. Among all these features, the most prominent ones are the features reproducing the actual content, while the additional or complementary information ones present a considerably lower degree of presence. According to the results, four web philosophy of communication archetypical models can be recognised. These models coincide with the four theoretical ones suggested by literature for the physical institutions and have been labelled as didactic museums, stimulating museums, discovery museums and constructivist museums. Statistical analyses have pointed out that there are five factors that

drive this group creation processes, namely, educational resources, searching and basic collection presentation, advanced collection and contents presentation, explaining content presentation and visual and author content presentation.

In addition to the delimitation of these four archetypical models, the research has supported the significance of the moderating factors such as cultural and corporate values. In this sense, the analytical processes have identified that there are some differences on the technological implementation by country and type of institutions. Looking at the country of origin, there are some differences on the features and degree of implementation of web technologies by museums. The most clarifying examples are the ones of the United Kingdom and the United States of America. Whilst the first one is more research focused, the latter one shows a more educational-oriented approach. It is of interest to underline that official definitions of museums of these countries also reflect divergent philosophies. Analysing the differences from the approach of the type of institution, diverse technological implementation patterns can be recognized along with different institutions. According to the obtained results, some types of institutions, mainly anthropology museums, present more deep, focused and complex contents, linked to the presumption of the greater specificity of their virtual visitors. Based on the findings of this work, it might be stated that cultural policies and corporate values of institutions impact and moderate the technology implementation for the communication of contents by museums.

Concerning the findings on the behaviour of the users, distinct patterns have been identified from both a global and an individual perspective. The analysis of the websites of the different selected museums has shown diverse global usage patterns that could be linked to their characteristics. In fact, while the Benaki Museum and the Diocesan and Regional Museum of Lleida show seasonal models, the Pitt Rivers Museum is related to an academic schedule model. Similarly, results from this research identify that there is a tight relationship between the mean length of the duration of the visits and the amount of visitors. Focused on the database of the website of the Pitt Rivers Museum, the research has acknowledged different degrees of utilization of the features of the database section based on individual users. Adding to it, the performed cluster analysis has identified four typologies of users, which are labelled as general actions visitors, indirect visitors, merely accessing visitors and extensive deeper visitors. All the clustering statistical process has been driven by two grouping factors, namely the general actions of the database and the

more sophisticated ones. The results of this cluster analysis are as well reaffirmed by the individual path analysis performed of some virtual visitors.

Findings of this work support that there are four different archetypical models of philosophy of communication, that cultural and corporate values moderate the implementation of web applications, that there are global differences on the usage of websites, as well as that there are different groups of virtual users of the specific section of the database of the Pitt Rivers Museum. The work brings in some new insight into the generic topic of the communication and access of cultural contents of museums in the current Knowledge Society.

5.2.- Situation of cultural institutions in the Knowledge Society

Cultural institutions are an integral part of the systems of the Knowledge Society. However, their adjustment to the new and evolving realm entails a structural and in-depth corporate change. Constant challenges have to be tackled by cultural institutions in this continuously transforming socio-technological juncture.

So from this stated point of view, it may be affirmed that the core aim and functions of culture have not varied and are still focused on creative processes, preservation and communication. Therefore, the whole cultural sector retains its traditional mission and functions. Being it so, it may be assumed that museums are still key cultural institutions in terms of cultural contents. That is, museums are still the main preservers of the collective memory of the past, as well as transmitters to the broader audience.

Nevertheless, based on what this thesis has already brought about, museums should face important challenges. Virtual visitors do no longer seek for magisterial didactic ways of communicating contents, but for more leisure and entertainment related ones as well. Museums do not have to discard their educational role, but the increasing sophistication of users also asks for greater leisure and entertainment components linked to the contents themselves. That is why, although it is at a very initial stage, the so-called edutainment activities are getting higher importance in the educational planning of cultural institutions and in the digital realm of museums. Moreover, participants look for more engaging opportunities and enhanced experiences.

In this general context, technologies represent an important helping tool for cultural institutions, mainly due to their huge communicative power. Technologies do not only improve access and communicative processes, but also internal management processes of the institutions. Thus, technology allows significant improvements for the whole structures and systems of cultural institutions. This fact supposes a need of integral readjustment of traditional functioning schemes and processes to the ongoing new challenges.

Consequently, the implementation of technological applications by museums and the necessity of a readjustment of the institutions and the global sector to the current juncture entail implications from a triple perspective. First, there are some evidences that suggest a need for a better adjustment to users' needs and expectation. Second, cultural institutions should face challenges regarding their new position into the Knowledge Society. Third, also policy makers should take into account some implications when they design policies dealing with culture and innovation.

5.2.1.- Implications to better host users' expectations

Users are a very important part of the cultural system, because, in fact, they are the final receivers of the communicated contents. Their role, anyhow, trespasses the passive consumer one, due to their greater access and interaction power. Virtual users of the digital resources of the websites of museums are aware of the opportunities provided by technological applications related to the instantaneity and continuous access to the contents. Therefore, once their needs and objectives have been identified, it is convenient for virtual visitors to evaluate the suitability of the digital resources and, if needed, access different sources to contrast or complement the generic contents. Logically, there are broader opportunities for virtual users to fulfil their needs and better meet the initial expectations by combining instantaneous and accessible contents.

Similarly, users are becoming increasingly sophisticated on their needs and expectations about the cultural digital contents. The access to plain information that provides no additional contents is no longer sought by virtual users. They are looking for complementary contents of the already available information and not a mere reproduction. As the sophistication of the needs and expectations grows, the demand for more complete and subsidiary contents is also intensifying.

Closely linked to this fact, users are expecting an exponential increase in the degree of customization of the digital contents provided by the institutions. In addition to the massive informational content, supplementary ones are expected by the users in order to fulfil more specific needs of the users. Virtual visitors ask for a more flexible utilization of the technological applications that allow a higher degree of getting customized contents.

It should be taken into account that the technological trend does also impact the degree of sophistication of the tools implemented by museums. It implies a growing need of larger competences among virtual visitors that will be achieved by the experience of new learning initiatives. The new technologies facilitate new access and interaction with the contents of museums through smart, context-aware artefacts and enhanced interfaces, but require at the same time a higher skilled and active user.

5.2.2.- Implications for cultural institutions

Facing the new reality, the activity of museums in the digital domain should move beyond the mere replica of the physical institution and take advantage of technological applications. Once the initial stage of development of digital leaflets has been overcome, it is appropriate for museums to avoid the simple reproduction of the content displayed in the physical institution and present additional information and features. The final aim is to complement the visibility of the cultural institution with contents that fulfil the needs and expectations of users. So, new support features, such as story-telling, learning and gaming applications will facilitate the improvement of user engagement with cultural resources.

In order to better adjust to this broader aim, it would be convenient for museums to develop a precise philosophy of communication strategy. It is not a futile issue, because its implementation defines the way and extent of communication of the digital cultural contents of the institution. Museums should be aware of the transformations taking place in the current context and adapt or readjust their current web philosophy of communications to better answer to the ongoing challenges. Moreover, in this sense, the implementation of technological features and applications has to be consequent with the adopted philosophy of communication. Therefore, the adoption of a web philosophy of communication has to be prior to the implementation of web applications to communicate cultural contents in a coherent way.

Taking into account the evidences found by the research, it can be suggested that cultural institutions with different philosophies of communication should implement diverse models of archetypical sections dealing with cultural contents. Nonetheless, at the light of the sophistication of needs of the virtual users, it should be appropriate that most of the cultural institutions start making a great part of their collections on the digital realm, to facilitate users' access to the cultural contents.

Similarly, according to the diverse visitor profiles outlined by the analyses, it can be suggested to move beyond the digital catalogues and implement complementary databases with more in-depth information to allow users to create their own knowledge. In this sense, the research considers opportune that cultural institutions who wish to gain a relevant place on the current competitive digital realm of the Knowledge Society **move towards the more user freedom-oriented philosophies of communication**, namely the discovery and the constructivist museum approaches. These two philosophies allow a greater degree of individual construction of knowledge, but put the emphasis on different aspects of this process. Thus, it is advisable for research-oriented institutions to put greater emphasis on the implementation of a complete database and, if considered necessary, to complement it with some educational resources. Learning-oriented institutions, on the other hand, should place a greater effort on the implementation of more advanced, interactive and appealing educational resources, which could be backed up by the implementation of a basic database for the reinforcement of the acquired information. Therefore, the present research suggests that most suitable philosophies of communication of cultural institutions in the digital realm of the Knowledge Society should be designed within the axis of the discovery museum and the constructivist one. As mentioned, main differences would arise from the subject of emphasis of the core philosophical aim of the institution.

Linked to the increasing sophistication of users, there is a need to implement further user-oriented applications by cultural institutions to fulfil visitors' expectations. There are enough evidences to suggest a move towards a more 2.0 and communicative philosophies. Virtual visitors should not be considered as consumers of cultural contents, but also as co-producers. This is what has been labelled as prosumers.

Besides, answering to the request of their virtual users, cultural institutions have to bear in mind that there is an increasingly evident need to adjust both the provided features as well

as contents to the personal and individual needs and expectations of each visitor. Therefore, it should be recommendable for museums to start implementing strategies of customization and personalization of the contents according to the personal and individual backgrounds and expectations of their visitors to the digital ambit of the institution.

Finally, the last implication for cultural institutions is the most theoretical one of all of them. The ongoing socio-technological transformations have changed the underlying structures and functioning schemes of all the ambits of current society. Museums, beyond their philosophy of communication, should readjust their role to the new environment. Museums will continue being the key preservers and communicators of the collective past memory of communities, but more sophisticated and leisure related ways of communication are expected to be implemented by these cultural institutions. Consequently, the cultural sector and practitioners have to define the updated role of cultural institutions in the Knowledge Society.

5.2.3.- Implications for policies

The last area of the main implications defined by this research relates to policy makers. The regulation of culture in relation to innovation and technological implementation has become a vital part of the policy making processes and have fostered the successful initial stages of adjustment of cultural institutions into the Knowledge Society. However, together with the advance to a more developed stage of technological implementation, policies have to reinforce the already reached objectives for the adaptation and modernization of cultural institutions.

In this sense, to elude the digital divide, cultural institutions should reinforce their inclusion and accessibility policies. Along with political initiatives, such as the eInclusion and the eAccessibility ones of the European Union, cultural policy makers should make the effort to avoid a set of museums to be left aside of current technological trends. If virtual visitors are not able to get integrated into the new technological systems and museums and cultural institutions do not impel their active involvement in all these processes, the divide between a segment of virtual visitors would be insuperable and some cultural institutions would inevitably be left behind in future economic and social developments.

Furthermore, when designing policies related to culture and innovation, industrial policy makers and cultural policy makers should bear in mind the distinct potential approaches to culture. On the one hand, it can be approached as an industry and economic activity; on the other, as arts, a system of values and individuals. The different administrative departments should try to collaborate and harmonize the twofold aims of cultural production. Generally speaking, industry fosters innovation to increase benefits by the improvement of the productive processes, but the cultural activity also pursues the improvement of preservation, communication and learning processes. Cultural institutions should better understand the double approach and redefine their role in the Knowledge Society and its general perspective will logically be different from the long established and adapted industrial sector. Hence, policy makers must take into account the diverse perspectives at the design of new policies concerning the cultural activity and innovation in this mentioned new reality. Acknowledging that there is already a scientific policy on current programs, such as the objective 8.2a of the ICT of the Seventh Framework Programme of the European Union, called *Technologies for creating personalised and engaging digital cultural experiences*, it will be convenient to work bridging cultural policies of museums with the technological formerly mentioned ones.

Summing up, the new situation of cultural institutions in the current technological development stage presents implications for policy makers, cultural institutions and social policies as a whole. Policy makers need to adopt a new vision and methods to better meet the needs of cultural institutions. Cultural practitioners, on the other hand, have to redefine the role of cultural institutions in the Knowledge Society to improve the implementation process of technological applications with cultural contents and, most importantly, to match future citizens' expectations. Finally, virtual users have to move from the passive conception of audience towards the more active one of participants. In this change of perspective, users will not only consume cultural contents but also produce them, reinforcing the figure of the prosumers. This new environment requires a new corporate culture based on the Open Innovation strategy. This perspective suggests that different agents and users of cultural institutions should collaborate and share knowledge to reinforce and accelerate innovation. Therefore, cultural institutions should allow users to contribute in any stage of the design process of cultural communication and better readjust it to the current needs of the very virtual visitors.

5.3.- Further research lines

The present research has shown some evidences about the usefulness of the designed conceptual framework to diagnose and operate with the cultural realm in the current socio-technological situation. Similarly, it has also brought some insight to the topic of the innovation and the technological implementation by cultural institutions to communicate and provide access to cultural contents in the Knowledge Society. Additionally, the research has identified some further research lines.

In the first place, a future study should approach an extension of the sample, including a bigger amount of institutions analysed. In this extension to a more universal sample, the research should include also museums and cultural institutions from non-Western cultures. Recapping, a future research line should extend the sample to a more universal one to test the global validity of the obtained results.

In addition to the theoretical analysis that has been performed by this research, it would be convenient to further investigate the real effectiveness of the identified models and their correspondent features to improve research and educational processes on users. This new approach to the analysis would shed some light on whether the institution focused on theoretical models of philosophy of communication optimally meet the pragmatic objectives, aims and expectations of virtual users.

An extended analysis of the virtual visitors and digital patterns would be of interest to better understand the cultural contents' consumption needs and technology usability in museums websites. This approach should be carried out accessing the primary sources of information. Taking into account the new environment, it would be convenient to study both virtual and physical visitors of museums to develop an enhanced model of demand and cultural participation.

The last further research line must integrate the physical and the virtual realms. Current society is characterised by a higher convergence between the cyber, social and physical domains. From this approach, future research should deepen and compare the philosophies of communication carried out in the physical and virtual domains of museums. This research would support the conceptual and theoretical development towards a new and integrated shaping of cultural institutions in the current juncture.

The present work has identified future potential research lines related to the generation of universal understanding of museums' philosophy of communication; the more holistic comprehension of the behaviour of participants in the virtual sphere; and hints towards a new approach to the analysis of the cultural participation in converging physical, social and cybernetic domains.

References

Bibliography

Agustín Lacruz, María del Carmen and Clavero Galofré, Manuel (2009): Indicadores sociales de inclusión digital: brecha y participación ciudadana, in Galindo, Fernando and Rover, Aires José [coords.]: *Derecho, gobernanza y tecnologías de la información en la sociedad del conocimiento*, Zaragoza: Prensas Universitarias de Zaragoza, 143-166.

Ahearne, Jeremy (2008): Cultural policy explicit and implicit: a distinction and some uses, *ICCPR 2008 – 5th International Conference on Cultural Policy Research, August 20-24*, *Istanbul*, Istanbul: Istanbul Metropolitan University and Yeditepe University. Available online at: http://iccpr2008.yeditepe.edu.tr/papers/Ahearne_Jeremy.doc. Last accessed 2010-06-10.

Aibar, Eduard (2004): Las culturas de Internet: la configuración sociotécnica de la red de redes, *Revista CTS, 11(4)*, 9-21. Available online at: http://escritoriodocentes.educ.ar/datos/recursos/articulos/culturas_internet.pdf. Last accessed 2010-08-10.

Aibar, Eduard (2008): Las culturas de Internet: La configuración sociotécnica de la red de redes, *Revista Iberoamericana de Ciencia, Tecnología y Sociedad - CTS, 4(11)*, 9-21.

Alexander, Edward P. (1989): *Museums in motion – An introduction to the history and functions of museums*, Nashville: American Association for State and Local History.

Alzua, Aurkene and Gil, Ion (2006): Diagnóstico y retos de la implementación tecnológica en el sector cultural. El caso de las instituciones y operadores culturales de Gipuzkoa, *III Congreso online - Observatorio para la Cibersociedad. Conocimiento abierto, sociedad libre*. Available online at: http://oliba.uoc.edu/aracne/uploads/publicaciones/III%20Congreso%20online%20Cibersociedad.pdf. Last accessed: 2011-09-17.

Appadurai, Arjún and Stenou, Katérina (2000): Sustainable pluralism and the future of belonging, in Arizpe, Lourdes [dir.]: *World Culture Report 2000: Cultural diversity, conflict and pluralism*, Paris: UNESCO Publishing, 111-123.

Ariño, Antonio (2000): *Sociología de la cultura. La constitución simbólica de la sociedad*, Barcelona: Ariel Sociología.

Arizpe, Lourdes [dir.] (2000): *World Culture Report 2000: Cultural diversity, conflict and pluralism*, Paris: UNESCO Publishing.

Arnoldus, Martija (2009): *Converging pathways to new knowledge*, LabforCulture. Available online at: http://live.labforculture.org/2009/07/newknowledge/files/converging_pathways_to_new_knowledge.pdf. Last accessed 2010-05-31.

Artnouveau Consortium (2003): *Artnouveau. On the transition to the digital era of arts and culture – State of the arts analysis*, Artnouveau Consortium. Available at: http://www.artnouveau.ccg.pt/Assets/docs/STAR%20Report.pdf. Last accessed 2006-01-10.

Baillet, Tómas and Guallar, Javier (2009): Networking y comunidades en la web social. Tres proyectos para mejorar la comunicación, *I Congreso internacional de ciberperiodismo y web 2.0, Bilbao, 11-13 noviembre 2009*. Available online at: http://eprints.rclis.org/17178/. Last accessed 2010-06-07.

Baron, Reuben M. and Kenny, David A. (1986): The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations, *Journal of Personality and Social Psychology, 51(6)*, 1173-1182.

Bassand, Michel (1992): *Cultura y regiones en Europa*, Barcelona: Diputació de Barcelona-Oikos.

Belli, Simone and López Raventós, Cristian (2008): Breve historia de los videojuegos, *Athenea Digital- Revista de pensamiento e investigación social, 14*, 159-179. Available online at: http://psicologiasocial.uab.es/athenea/index.php/atheneaDigital/article/view/570/437. Last accessed 2011-07-26.

Bennett, Tony (2001): *Differing diversities. Cultural policy and cultural diversity*, Strasbourg: Cultural Policy and Action Department, Council of Europe Publishing.

Berman, David (2008): Representing museum knowledge, in Marty, Paul F. and Burton Jones, Katherine [eds.]: *Museum Informatics. People, Information, and Technology in the Museums*, New York-London: Routledge, 35-57.

Bibel, Wolfgang (2004): *Converging Technologies and the Natural, Social and Cultural World*, European Communities. Available online at ftp://ftp.cordis.europa.eu/pub/foresight/docs/ntw_sig4_en.pdf. Last accessed 2010-05-24.

Bille, Trine (2008): The creative class and preferences for culture, *ICCPR 2008 – 5th International Conference on Cultural Policy Research, August 20-24, Istanbul*, Istanbul: Istanbul Metropolitan University and Yeditepe University. Available online at: http://iccpr2008.yeditepe.edu.tr/papers/Bille_Trine.doc. Last accessed 2010-06-10.

Bloem, Jaap; van Doorn, Menno and Duivestein, Sander (2009): *Me the Media. Rise of the Conversation Society. Past, present and future of the Third Media Revolution*, Amsterdam: VINT, Vision, Inspiration, Navigation, Trends Research Institute of Sogeti. Available online at http://www.methemedia.com/. Last accessed 2010-03-13.

Bonet, Lluís (2003): El aporte de la economía al análisis de indicadores culturales in *Seminario Latinoamericano sobre indicadores culturales: una contribución al estudio de la economía y la cultura*, Mexico: Sistema de Información Cultural. Available online at: http://sic.conaculta.gob.mx/documentos/815.pdf. Last accessed 2010-02-15.

Böse, Martina; Busch, Brigitta and Dragicevic Sesic, Milena (2006): Despite and beyond cultural policy: Third and Fourth-Sector practices and strategies in Vienna and Belgrade, in Meinhof, Ulrike Hanna and Triandafyllidou, Anna [eds.]: *Transcultural Europe: Cultural Policy in a changing Europe*, Hampshire-New York: Palgrave MacMillan, 131-156.

Braman, Sandra (1996): Art in the Information Economy. *Canadian Journal of Communication, 21(2)*. Available online at: http://www.cjc-online.ca/viewarticle.php?id=361. Last accessed 2009-12-16.

Bucci, Alberto and Segre, Giovanna (2009): *Human and Cultural capital complementarities and externalities in economic growth*, Milan: Dipartimento di Scienze Economiche Aziendali e Statistiche Universitá degli studi di Milano. Available online at: http://www.economia.unimi.it/index.php?id=389&wp=335&mode=view&L=1. Last accessed 2009-11-22.

Cachia, Romina; Kluzer, Stefano; Cabrera, Marcelino; Centeno, Clara and Punie, Yves (2007): *ICT, Social Capital and Cultural Diversity. Report on a Joint IPTS-DG INFSO Workshop held in Istanbul (Turkey), 25 April 2007*, Luxembourg: Office for Official Publications of the European Communities. Available online at: http://ftp.jrc.es/EURdoc/eur23047en.pdf. Last accessed 24-05-2010.

Cambra, Toni (2008): El web 2.0 com a distòpia en la recent Internet, *Digithum, 10*, Barcelona: Universitat Oberta de Catalunya. Available online at: www.uoc.edu/digithum/10/dt/cat/cambra.pdf. Last accessed 2010-06-07.

Cameron, Fiona (2003): The Next Generation – 'Knowledge Environments' and digital collections, *Papers Museums and the Web 2003*, Toronto: Archimuse. Available online at: http://www.archimuse.com/mw2003/papers/cameron/cameron.html. Last accessed 2010-02-03.

Cardús, Salvador; Berrio, Jordi; Bonet, Lluís; Saperas, Enric; Gifreu, Josep and Mari, Isidor (1991): *La política cultural europea. Una aproximación desde Cataluña al problema de las identidades culturales*, Madrid: Centro de Estudios Ramón Areces.

Carr, Julie (2009): *Creative industries, creative workers and the creative economy: a review of selected recent literature*, Scottish Government Social Research. Available online at: http://www.scotland.gov.uk/Resource/Doc/289922/0088836.pdf. Last accessed 2010-05-14.

Carrasco Arroyo, Salvador (2006): Medir la Cultura: Una tarea inacabada, *Periférica, 7*, 1-26.

Carreras, César (2004): *Situació de les tecnologies de la informació a les institucions de la memòria a Catalunya en desembre de 2004*, Barcelona: UOC. Available online at: http://oliba.uoc.edu/aracne/uploads/publicaciones/museus_tic_catalunya_2004.pdf. Last accessed 2007-04-16.

Carreras, César [ed.] (2005): *Patrimonio Cultural y Tecnologías de la Información y la Comunicación. A la búsqueda de nuevas fronteras*, Cartagena: Tendencias 2, Ayuntamiento de Cartagena, Concejalía de Cultura y 3000 Informática.

Carreras, César (2005): Museos enredados. Nuevos dilemas, nuevos horizontes en Internet, in Carreras, César. [ed.]: *Patrimonio Cultural y Tecnologías de la Información y la Comunicación. A la búsqueda de nuevas fronteras*, Cartagena: Tendencias 2, Ayuntamiento de Cartagena, Concejalía de Cultura y 3000 Informática, 161-181.

Carreras, César [coord.] (2009): *Evaluación TIC en el patrimonio cultural: metodologías y estudio de casos*, Barcelona: UOC.

Carreras, César and Munilla, Gloria (2005): *Patrimonio Digital*, Barcelona: UOC.

Castells, Manuel (2002): *The Information Age: Economy, Society and Culture I – The rise of the Network Society*, Oxford – Massachusetts: Blackwell Publishers.

Celaya, Javier and Viñarás, Mónica (2006): *Las nuevas tecnologías web 2.0 en la promoción de museos y centros de arte*, Madrid: Centro Cultural Conde Duque. Available online at: http://sic.conaculta.gob.mx/documentos/1151.pdf. Last accessed 2009-12-16.

CEPAL - Comisión Económica Para América Latina y el Caribe (2001): Information, Information Management and governance, CEPAL. Available at: http://www.cepal.org/publicaciones/xml/0/9880/carg0677.pdf. Last accessed 2009-11-19.

Chan, Sebastian (2007): Tagging and Searching: Serendipity and museum collection databases, *Museums and the Web 2007*. Available online at http://www.archimuse.com/mw2007/papers/chan/chan.html. Last accessed 2009-10-10.

Chen, Hsinchun; Houston, Andrea L.; Sewell, Robin R. and Schatz, Bruce R. (1998): Internet browsing and searching: User evaluations of category map and concept space techniques, *Journal of the American Society for Information Science, 49(7)*, 582-603.

Cheng, Sao-Wen (2002): Cultural Capital and the Consumption of Cultural Services, *Schmollers Jahrbuch 122(3)*, 445 - 468.

Cheng, Sao-Wen (2005): *Cultural Goods Production, Cultural Capital Formation and the Provision of Cultural Services*, Volkswirtschaftliche Diskussionsbeitraege, Universität Siegen, Fachbereich Wirtschaftswissenschaften, Wirtschaftsinformatik und Wirtschaftsrecht. Available online at: http://www.uni-siegen.de/fb5/vwl/repec/sie/papers/119-05.pdf. Last accessed 2009-11-08.

Choo, Chun Wei; Detlor, Brian and Turnbull, Don (2000): Working the Web: An empirical model of web use, *Proceedings of the 33rd Annual Hawaii International Conference on System Sciences – HICSS*. Available online at: http://www.viktoria.se/~dixi/BISON/resources/choo%20et%20al%202000.pdf. Last accessed 2010-07-12.

Codagnone, Cristiano [ed.] (2009): *Vienna study on inclusive innovation for growth and cohesion: modelling and demonstrating the impact of eInclusion*, Brussels: European Commission – Information Society and Media.

Coffee, Kevin (2008): Cultural inclusion, exclusion and the formative roles of museums, *Museum Management and Curatorship, 23(3)*, 261-279.

Cole, Timothy W. (2002): Creating a framework of guidance for building good digital collections, *First Monday, 7(5)*. Available online at: http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/955/876. Last accessed 2010-07-12.

Council of Europe (1997): *In from the margins: a contribution to the debate of culture and development in Europe*, Strasbourg: Council of Europe Publishing.

Council of Europe (2000): *Maximising the educational and cultural potential of the new information technologies*, Strasbourg: Council of Europe Publishing.

Craik, Jennifer (2007): *Re-visioning Arts and Cultural Policy*, Canberra: ANU ePress.

Cultural Ministers Council (2008): *Building a Creative Innovation Economy Opportunities for the Australian and New Zealand creative sector in the digital environment*, Canberra: Creative Innovation Economy Roundtable.

Cunningham, Stuart (2002*): From cultural to creative industries: Theory, industry, and policy implications. Media International Australia Incorporating Culture and Policy: Quarterly Journal of Media Research and Resources, 102*, 54-65. Available non-journal definitive version online at: http://eprints.qut.edu.au/588/1/cunningham_from.pdf. Last accessed 2010-08-10.

Cvjeticanin, Biserka [ed.] (2006): *Dynamics of Communication: new ways and new actors*, Zagreb: Institute for International Relations.

Czernich, Nina; Falck, Oliver; Kretschmer, Tobias and Woessmann, Ludger (2009): *Broadband infrastructure and economic growth,* Munich: CESifo Group, Munich. Available at: http://www.cesifo.de/DocCIDL/cesifo1_wp2861.pdf. Last accessed 2010-05-14.

D'Angelo, Mario and Vespérini, Paul (1999): *Cultural policies in Europe: Method and practice of evaluation*, Strasbourg: Council of Europe Publishing.

D'Angelo, Mario and Vespérini, Paul (2000): *Cultural policies in Europe: Regions and cultural decentralisation*, Strasbourg: Council of Europe Publishing.

Dawes, Sharon S. (2002): *The future of eGovernment*, Center for Technology in Government, University at Albany. Available online at: http://www.ctg.albany.edu/publications/reports/future_of_egov/future_of_egov.pdf. Last accessed 2009-12-14.

De Martí, Joan and Zenou, Yves (2009): *Social Networks*, Bonn: IZA Forschungsinstitut zur Zukunft der Arbeit. Available online at: http://ftp.iza.org/dp4621.pdf. Last accessed 2010-06-07.

De Silva, Nishadi (2003): The use of multimedia to better museum websites, *Multimedia Conference '03*. Available online at http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.12.666 . Last accessed 2009-09-13.

Dragicevic Sesic, Milena and Dragojevic, Sanjin (2006): Imagined or real divides?, in Meinhof, Ulrike Hanna and Triandafyllidou, Anna [eds.]: *Transcultural Europe: Cultural Policy in a changing Europe*, Hampshire-New York: Palgrave MacMillan, 43-56.

Ehrlich, Kate and Sadat Shami, N. (2010): Microblogging inside and outside the workplace, *Proceedings of the Fourth International AAAI Conference on Weblogs and Social Media, May 23-26, 2010*, 42-49, Washington D.C.: George Washington University. Available at: www.cs.cornell.edu/~sadats/icwsm2010.pdf. Last accessed 20/11/10.

Eisenberg, Christiane; Gerlach, Rita and Handke, Christian [eds.] (2006): *Cultural Indutries: The British experience in international perspective*, Berlin: Humboldt University.

ENISA (2010): *Online as soon as it happens*, Heraklion: European Network and Information Security Agency. Available online at: http://www.enisa.europa.eu/act/ar/deliverables/2010/onlineasithappens. Last accessed 2010-06-07.

ERICarts (2001): *Making the Information Society work for culture. Cultural policy objectives and measures in the evolving European Information Society*, Bonn: ERICarts.

European Commission (2002a): *The DigiCULT Report - Technological landscapes for tomorrow's cultural economy. Unlocking the value of cultural heritage*. Luxembourg: Office for Official Publications of the European Communities.

European Commission (2002b): *Innovation tomorrow- Innovation policy and the regulatory framework: Making innovation an integral part of the broader structural agenda*, Luxembourg: Office for Official Publications of the European Communities.

European Commission (2003a): *Choosing to grow: Knowledge, innovation and jobs in a cohesive society*, Luxembourg: Office for Official Publications of the European Communities.

European Commission (2003b): *Future directions of innovation policy in Europe*, Luxembourg: Office for Official Publications of the European Communities.

European Commission (2003c): *Towards a knowledge-based Europe: The European Union and the information society*, Luxembourg: Office for Official Publications of the European Communities.

European Commission (2004): *EP2010: The future of electronic publishing towards 2010. A strategic study on the future of research into publishing, content and knowledge technologies*, Luxembourg: Office for Official Publications of the European Communities. Available online at: http://bookshop.europa.eu/en/ep2010-the-future-of-electronic-publishing-towards-2010-pbKK5503302/. Last accessed 2010-05-24.

European Commission (2007a): *European i2010 initiative on e-Inclusion. To be part of the information society*, Brussels: Commission of the European Communities. Available online at: http://ec.europa.eu/information_society/activities/einclusion/docs/i2010_initiative/comm_native_com_2007_0694_f_en_acte.pdf. Last accessed 2010-05-24.

European Commission (2007b): *European i2010 initiative on e-Inclusion. To be part of the information society. Impact Assessment*, Brussels: Commission of the European Communities. Available online at: http://ec.europa.eu/information_society/activities/einclusion/docs/i2010_initiative/comm_native_com_2007_0694_1_en_divers1.pdf. Last accessed 2010-05-24.

European Commission (2007c): *i2010 e-Inclusion Subgroup National Reports*, Brussels: European Commission, Information Society and Media Directorate-General, ICT for Inclusion Unit.

European Council (2007): *Riga Ministerial Declaration on eInclusion*, Riga: European Council. Available online at: http://ec.europa.eu/information_society/events/ict_riga_2006/doc/declaration_riga.pdf. Last accessed 2010-05-24.

Fagerberg, Jan (2003): The Potential of Benchmarking as a Tool for Policy Learning, *The IPTS report. 9(71)*, 13-19.

Fagerberg, Jan and Srholec, Martin (2008): *Technology and Development: Unpacking the relationship(s)*, Oslo: Centre for Technology, Innovation and Culture, University of Oslo. Available online at: http://www.tik.uio.no/InnoWP/FagerbergSrholec_BC-WP2008.pdf. Last accessed 2009-11-08.

Falk, John H. and Dierking, Lynn D. (1992): *The museum experience*, Washington D.C.: Whalesback books.

Fernández Prado, Emiliano (1991): *La política cultural. Qué es y para qué sirve*, Gijón: Trea.

Fesel, Bernd and Söndermann, Michael (2007): *Culture and Creative Industries in Germany*, Bonn: German Commission for UNESCO.

Fidel, Raya; Davies, Rachel K.; Douglass, Mary H.; Holder, Jenny K.; Hopkins, Carla J.; Kushner, Elisabeth J;. Miyagishima, Bryan K. and Christina D. Toney (1999): A Visit to the Information Mall: Web Searching Behavior of High School Students, *Journal of the American Society for Information Science, 50*(1), 24 –37.

Fleming, Tom (2007): *A creative economy green paper for the Nordic Region*, Oslo: Nordic Innovation Centre.

Flew, Terry (2002): Beyond ad hocery: Defining Creative Industries, *Cultural Sites, Cultural Theory, Cultural Policy - The II International Conference on Cultural Policy Research*, Wellington: Creative Industries Faculty, QUT Faculties and Divisions.

Florida, Richard and Tinagli, Irene (2004): *Europe in the Creative Age*, London: Demos. Available online at: http://www.demos.co.uk/files/EuropeintheCreativeAge2004.pdf?1240939425. Last accessed 2010-07-06.

Freeman, Alan (2009): *Creativity in the Age of the Internet*, MPRA Paper no. 14903, Munich Personal RePEc Archive. Available online at: http://mpra.ub.uni-muenchen.de/14903/2/MPRA_paper_14903.pdf. Last accessed 2009-11-08.

Frey, Bruno S. (2005): *What values should count in the arts? The tension between economic effects and cultural value*, Zürich: Institute for Empirical Research in Economics. Available online at: http://www.iew.unizh.ch/wp/iewwp253.pdf. Last accessed 2009-11-08.

Fuchs, Christian; Hofkirchner, Wolfgang; Schafranek, Matthias; Raffl, Celina; Sandoval, Marisol and Bichler, Robert (2010): Theoretical Foundations of the Web: Cognition, Communication, and Co-Operation. Towards an Understanding of Web 1.0, 2.0, 3.0, *Future Internet 2010, 2*, 41-59. Available online at: http://fuchs.uti.at/wp-content/uploads/web2_futureinternet.pdf. Last accessed 2010-09-16.

Fumero, Antonio and Roca, Genís (2007): *Web 2.0*, Madrid: Fundación Orange. Available online at: http://www.oei.es/salactsi/WEB_DEF_COMPLETO2.pdf. Last accessed 2010-08-01.

Fundación de la Innovación Bankinter (2007a): *Innovación "The Wealth of Nations"*, Fundación de la Innovación Bankinter. Available online at: http://www.fundacionbankinter.org/system/documents/6005/original/7_innovacion_ES.pdf. Last accessed 2010-05-14.

Fundación de la Innovación Bankinter (2007b): *Web 2.0. El negocio de las Redes Sociales*, Fundación de la Innovación Bankinter. Available online at: http://www.fundacionbankinter.org/system/documents/5996/original/8_web20_ES.pdf. Last accessed 2010-05-31.

Fundación de la Innovación Bankinter (2008): *Tecnologías Móviles. Apertura y nuevos modelos de negocio*. Available online at http://www.fundacionbankinter.org/system/documents/5986/original/10_tecnologiasmoviles_ES.pdf. Last accessed 2010-05-31.

Galani, Areti (2003): Mixed Reality museum visits: Using new technologies to support co-visiting for local and remote visitors, *Museological Review, 10*, 1-15.

Galani, Areti and Chalmers, Matthew (2002): Can you see me? Exploring co-visiting between physical and virtual visitors, *Papers Museums and the web 2002*, Toronto: Archimuse. Available online at: http://www.archimuse.com/mw2002/papers/galani/galani.html. Last accessed 2010-10-07.

Galani, Areti and Chalmers, Matthew (2004): Production of pace as a collaborative activity, *Conference on Human Factors in Computing Systems – CHI '04*, New York: ACM Press, 1417-1420.

Galindo, Fernando and Rover, Aires José [coords.] (2009): *Derecho, gobernanza y tecnologías de la información en la sociedad del conocimiento*, Zaragoza: Prensas Universitarias de Zaragoza.

Galloway, Susan and Dunlop, Stewart (2006): Deconstructing the concept of 'Creative Industries', in Eisenberg, Christiane; Gerlach, Rita and Handke, Christian [eds.]: *Cultural Indutries: The British experience in international perspective*, Berlin: Humboldt University, 33-52.

Galloway, Susan and Dunlop, Stewart (2007): A critique of definitions of the cultural and creative industries in public policy, *International Journal of Cultural Policy, 13(1)*, 17-32.

Garnham, Nicholas (2005): From cultural to creative industries. An analysis of the implication of the "creative industries" approach to arts and media policy making in the United Kingdom, *International Journal of Cultural Policy, 11(1)*, 15-29.

Gelado, José Antonio (2007a): *Podcasting, la voz de la Red*. Available online at: http://www.consumer.es/web/es/tecnologia/internet/2007/05/31/163059.php. Last accessed 2007-10-29.

Gelado, José Antonio (2007b): *Podcasts de tecnología*. Available online at: http://www.consumer.es/web/es/tecnologia/internet/2007/07/10/164455.php. Last accessed 2007-10-29.

Gordon, Christopher (2008): Great expectations - The European Union and Cultural policy, *ICCPR 2008 – 5th International Conference on Cultural Policy Research, August 20-24, Istanbul*, Istanbul: Istanbul Metropolitan University and Yeditepe University. Available online at: http://iccpr2008.yeditepe.edu.tr/papers/Gordon_Christopher.doc. Last accessed 2010-06-10.

Gray, Clive (2008): Analysing cultural policy: Incorrigbly plural or ontologically incompatible?, *ICCPR 2008 – 5th International Conference on Cultural Policy Research, August 20-24, Istanbul*, Istanbul: Istanbul Metropolitan University and Yeditepe University. Available online at: http://iccpr2008.yeditepe.edu.tr/papers/Gray_Clive.doc. Last accessed 2010-06-10.

Ham, Sam H. (1994): Cognitive psychology and interpretation: synthesis and application, in Hooper-Greenhill, Eilean [ed.]: *The educational role of the museum*, London-New York: Routledge, 107-117.

Hautamäki, Antti (2010): Creative economy and culture at the heart of innovation policy, in Ministry of Education [ed.]: *Creative Economy and Culture in the Innovation Policy*, Helsinki: Ministry for Education, Department for Cultural, Sport and Youth Policy, 6-25.

Healy, Kieran (2002): Digital Technology and Cultural Goods, *The Journal of Political Philosophy, 10(4)*, 478-500.

Hein, George E. (1998): *Learning in the Museum*, London-New York: Routledge.

Hein, Jørgen (2002): Learning versus status? Kunstkammer or Schatzkammer?, *Journal of the History of Collections, 14*, 177-192.

Helsper, Ellen J. (2008): *Digital Inclusion: an analysis of social disadvantage and the Information Society*, London: Department for Communities and Local Government. Available online at: http://www.communities.gov.uk/publications/communities/digitalinclusionanalysis. Last accessed 2010-06-07.

Hesmondhalgh, David (2007): *The cultural industries*, Los Angeles-London-New Delhi-Singapore: SAGE.

Hilbert, Martin R. (2001): *From industrial economics to digital economics: an introduction to the transition*, Santiago de Chile: CEPAL-ECLAC. Available online at: http://www.eclac.cl/publicaciones/xml/3/6173/LCL1497.pdf. Last accessed 2009-11-22.

Hooper-Greenhill, Eilean [ed.] (1994): *The educational role of the museum*, London-New York: Routledge.

Hooper-Greenhill, Eilean (1994a): A new communication model for museums in Hooper-Greenhill, Eilean [ed.]: *The educational role of the museum*, London-New York: Routledge, 17-26.

Hooper-Greenhill, Eilean (1994b): The past, the present and the future: museum education from the 1790s to the 1990s, in Hooper-Greenhill, Eilean [ed.]: *The educational role of the museum*, London-New York: Routledge, 258-262.

Hooper-Greenhill, Eilean (1999): *Museums and the shaping of knowledge*, London-New York: Routledge.

Howard, Philip N. and Massanari, Adrienne (2007): Learning to search and searching to learn: income, education, and experience online, *Journal of Computer-Mediated Communication, 12*, 846-865.

Humphreys, Lee (2010): Historicizing microblogging, *CHI Workshop on Microblogging: What and How Can We Learn From It? 2010, April 10–15*, Atlanta: ACM. Available online at: http://www.cs.unc.edu/~julia/accepted-papers/Humphreys_HistoricizingTwitter.pdf . Last accessed 2010-09-22.

Janovic, Nikola and Mocnik, Rastko (2006): Three nexal registers: Identity, peripheral cultural industries and alternative cultures, in Meinhof, Ulrike Hanna and Triandafyllidou, Anna [eds.]: *Transcultural Europe: Cultural Policy in a changing Europe*, Hampshire-New York: Palgrave MacMillan, 223-253.

Jansen, Bernard J. (2000): An investigation into the use of simple queries on Web IR systems. *Information Research*: *An Electronic Journal, 6*(1), 1-10.

Jansen, Bernard J. and Spink, Amanda (2000): Methodological approach in discovering user search patterns through Web log analysis, *Bulletin of the American Society for Information Science, 27(1)*, 15-17.

Jansen, Bernard J.; Spink, Amanda and Saracevic, Tefko (2000): Real life, real users, and real needs: A study and analysis of user queries on the web. *Information Processing and Management. 36(2)*, 207-227.

Jeffrey, Liss and Nayman, Ira [ed.] (2001): *Vital links for a knowledge culture. Public access to new information and communication technologies*, Strasbourg: Council of Europe Publishing.

Jonassen, David H. [ed.] (2004): *Handbook of research for educational communications and technology*, New York: MacMillan.

Jones, Paul (2004): *Raymod Williams's Sociology of culture: a critical reconstruction*, New York: Palgrave MacMillan.

Kaasa, Anneli and Vadi, Maaja (2008): *How does Culture contribute to Innovation? Evidence from European countries*, Tartu: Faculty of Economics and Business Administration University of Tartu. Available online at: http://infutik.mtk.ut.ee/www/kodu/RePEc/mtk/febpdf/febawb63.pdf. Last accessed 2009-11-08.

Kainulainen, Kimmo (2010): Self-directive culture and strategic regional development work, in Ministry of Education [ed.]: *Creative Economy and Culture in the Innovation Policy*, Helsinki: Ministry for Education, Department for Cultural, Sport and Youth Policy, 26-35.

KEA European Affairs (2006): *The economy of culture in Europe*, Brussels: KEA European Affairs. Available at: http://www.keanet.eu/ecoculture/studynew.pdf. Last accessed 2009-11-22.

KEA European Affairs (2009a): *KEA Briefing: Towards a European Creativity Index*, Brussels: KEA European Affairs. Available online at: http://www.keanet.eu/creavityindexbrief.pdf. Last accessed 2009-11-22.

KEA European Affairs (2009b): *The impact of culture on creativity*, Brussels: KEA European Affairs. Available online at: http://www.keanet.eu/impactculturecreativityfull.pdf. Last accessed 2009-11-22.

KEA European Affairs (2011): *Mapping the Cultural and Creative Sectors in the EU and China: A Working Paper in support to the development of an EU-China Cultural and Creative Industries' (CCIs) platform*, Brussels: KEA European Affairs. Available at: http://www.keanet.eu/report/china%20eu%20creative%20industries%20mapping%20full.pdf. Last accessed 2011-02-22.

Kim, W. Chan and Mauborgne, Renée (2005): *Blue Ocean Strategy. How to create uncontested market space and make the competition irrelevant*, Boston: Harvard Business School Press.

Kotler, Neil (2001): New Ways of Experiencing Culture: the Role of Museums and Marketing Implications, *Museum Management and Curatorship, 19(4)*, 417-425.

Kravchyna, Victoria and Hastings, Sam (2002): Informational value of museum web sites, *First Monday, 2(4)*. Available online at: http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/929/851. Last accessed 2010-07-12.

Lasuén, José Ramón and Aranzadi, Javier (2002): *El crecimiento económico y las artes*, Madrid: Fundación Autor.

Lexmond, Jen and Wright, Shelagh (2009): *Making of me*, London: Demos. Available at: http://www.demos.co.uk/files/Making_of_Me_web.pdf?1257178096. Last accessed 2010-05-14.

López de Aguileta, Iñaki (2000): C*ultura y ciudad. Manual de política cultural municipal*, Gijón: Trea.

Loran Gili, Margarida (2002): *Online Museums and Audiences: contribution of museum websites to access and audience development*, Dissertation MA Heritage Management, University of Greenwich Business School.

Lusoli, Wainer and Miltgen, Caroline (2009): *Young people and emerging digital services: an exploratoty survey on motivations, perceptions and acceptance of risks*, Sevilla: Joint Research Centre Institute for Prospective Technological Studies. Available online at: http://ftp.jrc.es/EURdoc/JRC50089.pdf. Last accessed 2010-06-10.

Lynch, Clifford (2002): Digital collections, digital libraries and the digitization of cultural heritage information, *First Monday, 7(5)*. Available online at: http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/949/870. Last accessed 2010-07-12.

Mancini, John (2009): *8 reasons you need a strategy for managing information – before it's too late…*, AIIM. Available online at: http://www.aiim.org/forms/downloads/8things%20ebook--info%20mgmt--ebook--landscape.pdf. Last accessed 2009-11-19.

Mansell, Robin (2001): The deep structure of knowledge societies, in Jeffrey, L. and Nayman, I. [ed.]: *Vital links for a knowledge culture. Public access to new information and communication technologies*, Strasbourg: Council of Europe Publishing, 55-73.

Martínez, Santi and Mendoza, Roser (2004): TICs y gestión cultural ¿Políticas e-culturales?, *Boletín GC: Gestión Cultural, 10*. Available online at: www.gestioncultural.org/boletin/pdf/SMartinez.pdf. Last accessed 2008-02-12.

Marty, Paul F. (1999): Museum informatics and information infrastructures: supporting collaboration across intra-museum boundaries, *Archives and Museum Informatics, 13*, 169-179.

Marty, Paul F. (2007): Museum Websites and Museum Visitors: Before and After the Museum Visit, *Museum Management and Curatorship, 22(4*), 337-360.

Marty, Paul F. (2008a): An introduction to Museum Informatics, in Marty, Paul F. and Burton Jones, Katherine [eds.]: *Museum Informatics. People, Information, and Technology in the Museums*, New York-London: Routledge, 3-8.

Marty, Paul F. (2008b): Collections and Consortia, in Marty, Paul F. and Burton Jones, Katherine [eds.]: *Museum Informatics. People, Information, and Technology in the Museums*, New York-London: Routledge, 217-221.

Marty, Paul F. (2008c): Information organization and access, in Marty, Paul F. and Burton Jones, Katherine [eds.]: *Museum Informatics. People, Information, and Technology in the Museums*, New York-London: Routledge, 79-83.

Marty, Paul F. (2008d): Information representation, in Marty, Paul F. and Burton Jones, Katherine [eds.]: *Museum Informatics. People, Information, and Technology in the Museums*, New York-London: Routledge, 29-34.

Marty, Paul F. and Burton Jones, Katherine [eds.] (2008): *Museum Informatics. People, Information, and Technology in the Museums*, New York-London: Routledge.

Marty, Paul F. and Twidale, Michael B. (2004): Lost in gallery space: A conceptual framework for analysing the usability flaws of museum Web sites, *First Monday, 9(9)*. Available online at: http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/1171/1091. Last accessed 2010-07-12.

Matarasso, François and Landry, Charles (2000): *Balancing act: twenty-one strategic dilemmas in cultural policy*, Strasbourg: Cultural Policies Research and Development Unit, Council of Europe Publishing,.

Mediacult (1999): *Digital Culture in Europe. A selective inventory of centres of innovation in the arts and new Technologies*, Strasbourg: Council of Europe Publishing.

Meihnhof, Ulrike Hanna and Tryandafyllidou, Anna [eds.] (2006): *Transcultural Europe. Cultural policy in a changing Europe*, Basingstoke and New York: Palgrave McMillan.

Meinhof, Ulrike Hanna and Triandafyllidou, Anna (2006): Transcultural Europe: An introduction in cultural policy in a changing Europe, in Meinhof, Ulrike Hanna and Triandafyllidou, Anna [eds.]: *Transcultural Europe: Cultural Policy in a changing Europe*, Hampshire-New York: Palgrave MacMillan, 3-23.

Meinhof, Ulrike Hanna and Triandafyllidou, Anna [eds.] (2006): *Transcultural Europe: Cultural Policy in a changing Europe*, Hampshire-New York: Palgrave MacMillan.

Ministerio de Cultura (2006): *El valor económico de la cultura en España*, Madrid: Ministerio de Cultura.

Ministerio de Cultura (2008): *El valor económico de la cultura en España. Resultados 2000-2005. Introducción y breve referencia metodológica*, Madrid: Ministerio de Cultura.

Ministry of Education [ed.] (2010): *Creative Economy and Culture in the Innovation Policy*, Helsinki: Ministry for Education, Department for Cultural, Sport and Youth Policy.

NASAA (2010): *Why should government support the arts?*, Washington D.C.: National Assembly of State Arts Agencies. Available online at: http://www.nasaa-arts.org/Advocacy/Advocacy-Tools/Why-Government-Support/index.php. Last accessed 2010-08-09.

National Museum Directors' Conference (2004a): *Museums and galleries: Creative engagement*, London: National Museum Directors' Conference.

National Museum Directors' Conference (2004b): *Valuing museums: Impact and innovation among national museums*, London: National Museum Directors' Conference.

Neßelrath, Robert (2006): *Web 3.0 - A.I. Tools Seminar,* Universität des Saarlandes. Available online at: http://www.dfki.de/~kipp/seminar_ws0607/reports/RobertNesselrath.pdf. Last accessed 2010-09-16.

Nickerson, Matthew (2002): Voices: Bringing multimedia museum exhibits to the World Wide Web, *First Monday, 7(5)*. Available online at: http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/951/872. Last accessed 2010-07-12.

Nordmann, Alfred (2004): *Converging Technologies – Shaping the future of European societies*, Luxembourg: Office for Official Publications of the European Communities.

Normore, Lorraine (2003): Studying special collection and the Web: an analysis of practice, *First Monday, 8(10)*. Available online at: http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/1085/1005. Last accessed 2010-07-12.

O'Reilly, Tim and Battelle, John (2009): Web Squared: Web 2.0 five years on, *Web 2.0 Summit*, San Francisco: Techweb and O'Reilly Media. Available online at: http://www.web2summit.com/web2009/public/schedule/detail/10194. Last accessed 2010-06-07.

Obuljen, Nina (2005): *Why we need European cultural policies. The impact of EU enlargement on cultural policies in transition countries*, Amsterdam: European Cultural Foundation.

Owen, Janet (2006): Collecting artefacts, acquiring empire: Exploring the relationship between Enlightenment and Darwinist collecting and late-nineteenth-century British imperialism, *Journal of the History of Collections, 18*, 9-25.

Packer, Randall and Jordan, Ken [eds.] (2001): *Multimedia: From Wagner to Virtual Reality*, New York: Norton.

Peacock, Darren (2008a): Making Ways for Change: Museums, Disruptive Technologies and Organisational Change, *Museum Management and Curatorship, 23(4)*, 333-351.

Peacock, Darren (2008b): The Information Revolution on Museums, in Marty, Paul F. and Burton Jones, Katherine [eds.]: *Museum Informatics. People, Information, and Technology in the Museums*, New York-London: Routledge, 59-76.

Pearce, Susan M. (2003): *On collecting. An investigation into collecting tradition in the European tradition*, London-New York: Routledge.

Petch, Alison (2006): Chance and certitude: Pitt Rivers and his first collection, *Journal of the History of Collections, 18*, 257-266.

Power, Dominic and Nielsén, Tobias (2010): *Priority Sector Report: Creative and Cultural Industries*, Stockholm: Europe Innova – European Cluster Observatory. Available online at: http://www.clusterobservatory.eu/upload/CreativeAndCulturalIndustries.pdf. Last accessed 2010-08-09.

Prensky, Marc (2001): Digital Natives, Digital Immigrant, *On the Horizon*, *9(5)*, 1-6.

Quéau, Philippe (2003): *Information Policies for Knowledge Societies*, Moscow: EVA. Available online at: http://evarussia.ru/upload/doklad/dokladEn_1080.doc. Last accessed 2009-07-23.

Raffl, Celina; Hofkirchner, Wolfgang; Fuchs, Christian and Schafranek, Matthias (2008): The Web as Techno-Social System. The Emergence of Web 3.0, in Trappl, Robert [ed.]: *Cybernetics and Systems 2008*, Vienna: Austrian Society for Cybernetic Studies, 604-609. Available online at: http://www.bertalanffy.org/media/pdf/pdf39.pdf. Last accessed 2010-05-04.

Rapeti, Emanuele and Cantoni, Lorenzo (2010): "Digital Natives" and learning with the ICTs. The "GenY @ work" research in Ticino, Switzerland, *Journal of e-Learning and Knowledge Society, 6(1)*, 39-49. Available online at: http://je-lks.maieutiche.economia.unitn.it/index.php/Je-LKS_EN/article/viewFile/386/373 . Last accessed 2010-09-15.

Ray, Kathrin and Day, Joan (1998): Student attitudes towards electronic information resources, *Information Research, 4(2)*. Available at: http://informationr.net/ir/4-2/paper54.html. Last accessed 2010-07-03.

Ringland, Gill (2004): *Scenarios for Europe in 2020*, European Communities. Available online at: http://ec.europa.eu/research/conferences/2004/ntw/pdf/scenarios_report_en.pdf. Last accessed 2010-10-12.

Roca, Beatriu (2009): Cibermuseografía in Carreras, César [coord.]: *Evaluación TIC en el patrimonio cultural: metodologías y estudio de casos*, Barcelona: UOC, 175-200.

Romiszowski, Alexander and Mason, Robin (2004): Computer-mediated communication in Jonassen, David H. [ed.]: *Handbook of research for educational communications and technology*, New York: MacMillan, 397-431.

Roodhouse, Simon (2006): *Cultural Quarters. Principles and practices*, Bristol: Intellect.

Roush, Wade (2005): Social Machines. Computing means connecting. *Technology review, August*. Available online at: http://www.technologyreview.com/communications/14664/. Last accessed 2007-10-29.

Royseng, Sigrid (2008): The ritual logic of cultural policy, *ICCPR 2008 – 5th International Conference on Cultural Policy Research, August 20-24, Istanbul*, Istanbul: Istanbul Metropolitan University and Yeditepe University. Available online at: http://iccpr2008.yeditepe.edu.tr/papers/Royseng_Sigrid.doc. Last accessed 2010-06-10.

Sandell, Richard (1998): Museums as agents of social inclusion, *Museum Management and Curatorship, 17(4)*, 401-418.

Sassatelli, Monica (2006): The logic of Europeanizing cultural policy, in Meinhof, Ulrike Hanna and Triandafyllidou, Anna [eds.]: *Transcultural Europe: Cultural Policy in a changing Europe*, Hampshire-New York: Palgrave MacMillan, 24-42.

Sassen, Saskia (2002): Towards a Sociology of Information Technology, *Current Sociology, 50(3)*, 265-388.

Silberglitt, Richard; Antón, Philip S.; Howell, David R.; Wong, Any; Gassman, Natalie; Jackson, Brian A.; Landree, Eric; Pfleeger, Shari Lawrence; Newton, Elaine M.; Wu, Felicia (2006): *The Global Technology Revolution 2020, in-depth analyses. Bio/Nano/Materials/Information trends, drivers, barriers, and social implications*, Santa Monica-Arlington-Pittsburgh: RAND Corporation. Available at: http://www.rand.org/pubs/technical_reports/2006/RAND_TR303.pdf. Last accessed 2010-05-31.

Silva, Juan M.; Mahfujur Rahman, Abu Saleh Md. and El Saddik, Abdulmotaleb (2008): Web 3.0: a vision for bridging the gap between real and virtual, *CommunicabilityMS '08 - Proceeding of the 1st ACM international workshop on Communicability design and evaluation in cultural and ecological multimedia*, 9-14, Vancouver. Available online at: http://www.lpru.ac.th/Academic_54/wp-content/uploads/2011/01/P51122660123.pdf. Last accessed 2010-05-04.

Söndermann, Michael; Backes, Christoph; Arndt, Olaf and Brünink, Daniel (2009a): *Gesamtwirtschaftliche Perspektiven der Kultur- und Kreativwirtschaft in Deutschland. Kurzfassung eines Forschungsgutachtens im Auftrag des Bundesministeriums für Wirtschaft und Technologie*, Berlin: Bundesministerium für Wirtschaft und Technologie (BMWi).

Söndermann, Michael; Backes, Christoph; Arndt, Olaf and Brünink, Daniel (2009b): *Kultur- und Kreativwirtschaft: Ermittlung der gemeinsamen charakteristischen Definitionselemente der heterogenen Teilbereiche der „Kulturwirtschaft" zur Bestimmung ihrer Perspektiven aus volkswirtschaftlicher Sicht*, Köln-Bremen-Berlin: Bundesministerium für Wirtschaft und Technologie. Available at: http://www.kultur-kreativ-wirtschaft.de/Dateien/KuK/PDF/doku-577-gesamtwirtschaftliche-perspektiven-kultur-und-kreativwirtschaft-langfassung,property=pdf,bereich=kuk,sprache=de,rwb=true.pdf. Last accessed 2010-05-14.

Soren, Barbara J. (2009): Museum experiences that change visitors, *Museum Management and Curatorship, 24(3)*, 233-251.

Spink, Amanda; Jansen, Bernard J. and Ozmultu, H. Cenk (2000): Use of query reformulation and relevance feedback by Excite users, *Internet Research: Electronic Networking Applications and Policy, 10(4)*, 317-328.

Spink, Amanda; Wolfram, Dietmar; Jansen, Bernard J. and Saracevic, Tefko (2001): Searching the Web: the public and their queries, *Journal of the American Society for Information Science and Technology*, *52(3)*, 226-234.

Statistics Canada (2005): *Canadian Heritage Information Network's 2004 Survey of Visitors to Museums' Web Space and Physical Space. Survey Documentation and Findings*, Statistical Consultation Group Statistics Canada. Available online at: http://www.pro.rcip-chin.gc.ca/contenu_numerique-digital_content/2004survey-2004survey/index-eng.jsp. Last accessed 2010-12-20.

Steingress, Gerhard (2002): La cultura como dimensión de la globalización: Un nuevo reto para la sociología, *Revista Española de Sociología*, *2*, 77-96.

Surovy, John (2007): *Web 3.0, the semantic web. The future of the Internet*, Bowie State University - University of Maryland in Europe. Available online at: http://ac-support.europe.umuc.edu/~sdean/ProfPaps/Bowie/T4-0607/Surovy.pdf. Last accessed 2010-09-16.

Surowiecki, Joshua (2006): Del.icio.us (Yahoo): How tags exploit the self-interest of individuals to organize the Web for everyone. *Technology Review, 35*. Available online at: http://www.technologyreview.com/tr35/Profile.aspx?TRID=432. Last accessed 2007-10-29.

Suteu, Corina (2006): The "Tinkelink Effect": Cultural networks, between encounter and connection in Europe, in Cvjeticanin, Biserka [ed.]: *Dynamics of Communication: new ways and new actors*, Zagreb: Institute for International Relations, 321-326.

Thomas, Wendy A. and Carey, Sheila (2005): Actual/virtual visits: What are the links?, *Papers Museums and the Web 2005*, Toronto: Archimuse. Available online at: http://www.archimuse.com/mw2005/papers/thomas/thomas.html. Last accessed 2010-06-12.

Throsby, David (2003): *Economics and Culture*, Cambridge: Cambridge University Press.

Torrent Sellens, Joan (2009): Conocimiento, redes y actividad económica: un análisis de los efectos de red en la economía del conocimiento, *UOC Papers Revista sobre la Societat del Coneixement, 8*, 3-22, Barcelona: UOC . Available at: http://www.uoc.edu/uocpapers/8/dt/esp/torrent.pdf. Last accessed 2009-11-22.

Trappl, Robert [ed.] (2008): *Cybernetics and Systems 2008*, Vienna: Austrian Society for Cybernetic Studies

UK Online Centres (2008): *Digital inclusion, social impact: a research study*, Sheffield: UK online centres. Available online at: http://www.ukonlinecentres.com/corporate-pages/research/centres-research.html. Last accessed 2010-06-10.

UNESCO (1982): *Mexico City Declaration on Cultural Policies*, Mexico City: World Conference on Cultural Policies. Available online at: http://portal.unesco.org/culture/en/files/12762/11295421661mexico_en.pdf/mexico_en.pdf. Last accessed 2008-06-25.

UNESCO (2009): *The 2009 UNESCO Framework for Cultural Statistics (FCS)*, Paris: UNESCO. Available online at: http://unesdoc.unesco.org/images/0018/001840/184082e.pdf. Last accessed 2009-11-23.

Uzelac, Aleksandra (2006): Cultural Networks in Virtual Sphere. Between infrastructure and communities, in Cvjeticanin, Biserka [ed.]: *Dynamics of Communication: new ways and new actors*, Zagreb: Institute for International Relations, 305-317.

Valtysson, Bjarki (2008): Access Culture: How digital communication and new media platforms increase cultural participation, *ICCPR 2008 – 5th International Conference on Cultural Policy Research, August 20-24, Istanbul*, Istanbul: Istanbul Metropolitan University and Yeditepe University. Available online at: http://iccpr2008.yeditepe.edu.tr/papers/Valtysson_Bjarki.doc. Last accessed 2010-06-10.

Villalba, Ernesto (2008): *On Creativity: Towards an understanding of Creativity and Innovation and its measurement*, Luxembourg: Office for Official Publications of the European Communities. Available online at: http://crell.jrc.ec.europa.eu/Publications/CRELL%20Research%20Papers/EVillalba_creativity_EUR_web.pdf. Last accessed 2009-11-22.

Wildavsky, Aaron (1993): *Speaking truth to power. The art and craft of policy analysis*, New Brunswick: Transaction Publishers.

Wilson, Tom D. (2000): Human Information Behavior, *Informing Science, 3(2)*, 49-55. Available online at: http://inform.nu/Articles/Vol3/v3n2p49-56.pdf. Last accessed 2009-11-22.

Yusuf, Shahid (2007): *From Creativity to Innovation. World Bank Policy Research Working Paper 4262*, Washington D.C.: World Bank. Available online at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=996168. Last accessed 2011-07-26.

Zinnbauer, Dieter (2007): *What can Social Capital and ICT do for Inclusion?*, Luxembourg: Office for Official Publications of the European Communities. Available online at: http://ftp.jrc.es/EURdoc/eur22673en.pdf. Last accessed 2010-05-24.

Zorich, Diane M. (2008): Information policy in museums, in Marty, Paul F. and Burton Jones, Katherine [eds.]: *Museum Informatics. People, Information, and Technology in the Museums*, New York-London: Routledge, 85-127.

Electronic resources

American Association of Museums:

http://www.aam-us.org. Last accessed 2009-11-17.

Brooklyn Museum Twitter:

http://twitter.com/brooklynmuseum. Last accessed 2010-11-23.

Canadian Museums Association:

http://www.museums.ca/. Last accessed 2009-11-17.

Chicago History Museum Blog:

http://blog.chicagohistory.org/. Last accessed 2010-11-24.

Delicious:

http://www.delicious.com. Last accessed 2010-05-24.

Euroresidentes:

http://www.euroresidentes.com/. Last accessed 2010-05-12.

Google Art Project:

http://www.googleartproject.com/. Last accessed 2011-07-31.

ICOM:

http://icom.museum. Last accessed 2009-11-17.

Indianapolis Museum of Art Blog:

http://www.imamuseum.org/blog/. Last accessed 2010-11-24.

IP-address.com - IP Tracer and IP Locator:

http://www.ip-adress.com/whois/. Last accessed 2010-11-27.

J. Paul Getty Museum Twitter:

http://twitter.com/GettyMuseum. Last accessed 2010-11-23.

Ministry of Culture of Spain:

http://www.mcu.es. Last accessed 2010-11-17.

MoMA Blog:

http://www.moma.org/explore/inside_out. Last accessed 2010-11-24.

Museum Australia:

http://www.museumsaustralia.org.au/. Last accessed 2009-11-17.

Museums Association (United Kingdom):

http://www.museumsassociation.org. Last accessed 2009-11-17.

Plurk:

http://www.plurk.com. Last accessed 2010-11-23.

RRC eMarketing:

http://www.rrc-emarketing.com/. Last accessed 2011-07-31.

Tumblr:

http://ww.tumblr.com. Last accessed 2010-11-23.

Twitter:

http://www.twitter.com. Last accessed 2010-11-23.

Virtual Library of Museums (VLM) of ICOM:

http://icom.museum/vlmp. Last accessed 2008-02-13.

Institutional documents

European Union

RESOLUTION OF THE MINISTERS RESPONSIBLE FOR CULTURAL AFFAIRS, meeting within the Council, of 13 June 1985 concerning the annual event "European City of Culture" [85/C 153/02]

COUNCIL DECISION of 15 June 1987 adopting the European Community Action Scheme for the Mobility of University Students (ERASMUS) [87/327/EEC]

COUNCIL DECISION of 28 July 1989 establishing an action programme to promote foreign language competence in the European Community (Lingua) [89/489/EEC]

COUNCIL DECISION of 14 December 1989 amending Decision 87/327/EEC adopting the European Community action scheme for the mobility of university students (Erasmus) [89/663/EEC]

COUNCIL DECISION of 18 December 1989 establishing an action programme to promote innovation in the field of vocational training resulting from technological change in the European Community (Eurotecnet) [89/657/EEC]

RESOLUTION OF THE COUNCIL AND MINISTERS FOR EDUCATION, MEETING WITHIN THE COUNCIL of 6 December 1990 concerning the Eurydice Education Information Network in the European Community [90/C 329/08]

COUNCIL DECISION of 21 December 1990 concerning the implementation of an action programme to promote the development of the European audiovisual industry (Media) (1991 to 1995) [90/685/EEC]

RESOLUTION on a Community initiative in favour of border areas (INTERREG programme) [C/175/1990]

TREATY ON EUROPEAN UNION (TEU), signed in Maastricht on 7 February 1992 [C/191/1992]

CONCLUSIONS OF THE COUNCIL of 10 November 1994 on the Commission communication concerning European Community action in support of culture [94/C 348/01]

COUNCIL DECISION of 6 December 1994 establishing an action programme for the implementation of a European Community vocational training policy [94/819/EC]

DECISION No 819/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 March 1995 establishing the Community action programme "Socrates" [819/95/EC]

DRAFT RESOLUTION of 4 April 1995 on culture and the multimedia [95/C 247/01]

COUNCIL REGULATION (EC) No 2236/95 of 18 September 1995 laying down general rules for the granting of Community financial aid in the field of trans-European networks – eTen [2236/1995/EC]

COUNCIL DECISION of 22 December 1995 on the implementation of a training programme for professionals in the European audiovisual programme industry (Media II - Training) [95/564/EC]

COMMUNICATION FROM THE COMMISSION to the European Parliament and the Council concerning a multi-annual Community programme to stimulate the development of a European multimedia content industry and to encourage the use of multimedia content in the emerging information society (INFO 2000) [COM/95/149 final]

DECISION No 719/96/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 29 March 1996 establishing a programme to support artistic and cultural activities having a European dimension (Kaleidoscope) [719/96/EC]

COUNCIL DECISION of 20 May 1996 adopting a multiannual Community programme to stimulate the development of a European multimedia content industry and to encourage the use of multimedia content in the emerging information society (INFO 2000) [96/339/EC]

COUNCIL RESOLUTION of 25 July 1996 on access to culture for all [96/C 242/01]

COUNCIL DECISION of 21 November 1996 on the adoption of a multiannual programme to promote the linguistic diversity of the Community in the information society MLIS [96/664/EC]

DECISION NO 2085/97/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 6 October 1997 establishing a programme of support, including translation, in the field of books and reading (Ariane) [2085/97/EC]

DECISION No 2228/97/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 October 1997 establishing a Community action programme in the field of cultural heritage (the Raphael programme) [2228/97/EC]

Proposal for a COUNCIL DECISION establishing the second phase of the Community vocational training action programme "Leonardo da Vinci" [COM (1998) 330 final]

DECISION No 253/2000/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 January 2000 establishing the second phase of the Community action programme in the field of education "Socrates" [253/2000/EC]

DECISION No 508/2000/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 February 2000 establishing the Culture 2000 programme [508/2000/EC]

COMMUNICATION FROM THE COMMISSION TO THE MEMBER STATES of 28 April 2000 laying down guidelines for a Community initiative concerning trans-European cooperation intended to encourage harmonious and balanced development of the European territory - Interreg III [2000/C 143/08]

COUNCIL DECISION of 20 December 2000 on the implementation of a programme to encourage the development, distribution and promotion of European audiovisual works (MEDIA Plus - Development, Distribution and Promotion) (2001-2005) [2000/821/EC]

COUNCIL DECISION of 22 December 2000 adopting a multiannual Community programme to stimulate the development and use of European digital content on the global networks and to promote linguistic diversity in the information society – eContent [2001/48/EC]

DECISION No 163/2001/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 January 2001 on the implementation of a training programme for professionals in the European audiovisual programme industry (MEDIA-Training) (2001-2005) [163/2001/EC]

DECISION NO 1513/2002/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 June 2002 concerning the sixth framework programme of the European Community for research, technological development and demonstration activities, contributing to the creation of the European Research Area and to innovation (2002 to 2006) [1513/2002/EC]

COMMUNICATION FROM THE COMMISSION. Choosing to grow: Knowledge, innovation and jobs in a cohesive society Report to the Spring European Council, 21 March 2003 on the Lisbon strategy of economic, social and environmental renewal [COM(2003) 5 final/2]

DECISION No 2256/2003/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 November 2003 adopting a multiannual programme (2003-2005) for the monitoring of the eEurope 2005 action plan, dissemination of good practices and the improvement of network and information security (MODINIS) [2256/2003/EC]

COMMUNICATION FROM THE COMMISSION. Making citizenship Work: fostering European culture and diversity through programmes for Youth, Culture, Audiovisual and Civic Participation [COM (2004) 154 final]

DECISION NO 456/2005/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2005 establishing a multiannual Community programme to make digital content in Europe more accessible, usable and exploitable – eContentplus [456/2005/EC]

COMMUNICATION FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS "i2010 – A European Information Society for growth and employment" [COM (2005) 229 final]

DECISION NO 1639/2006/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 October 2006 establishing a Competitiveness and Innovation Framework Programme (2007 to 2013) [1639/2006/EC]

DECISION No 1855/2006/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 December 2006 establishing the Culture Programme (2007 to 2013) [1855/2006/EC]

DECISION No 1904/2006/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 December 2006 establishing for the period 2007 to 2013 the programme 'Europe for Citizens' to promote active European citizenship [1904/2006/EC]

DECISION No 1982/2006/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007-2013) [1982/2006/EC]

RESOLUTION OF THE COUNCIL of 16 November 2007 on a European Agenda for Culture [2007/C 287/01]

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. European i2010 initiative on e-Inclusion. "To be part of the information society" [COM (2007) 694 final]

DECISION No 1350/2008/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 concerning the European Year of Creativity and Innovation (2009) [1350/2008/EC]

COMMISSION STAFF WORKING DOCUMENT Accompanying document to the COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS, "Towards an accessible information society". Status and challenges of e-accessibility in Europe [SEC (2008) 2916]

CONCLUSIONS OF THE COUNCIL AND OF THE REPRESENTATIVES OF THE GOVERNMENTS OF THE MEMBER STATES, meeting within the Council, on the Work Plan for Culture 2008-2010 [2008/C 143/06]

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. A Digital Agenda for Europe [COM (2010) 245]

COMMUNICATION FROM THE COMMISSION. EUROPE 2020: A strategy for smart, sustainable and inclusive growth [COM (2010) 2020]

ICOM

ICOM Statutes – Internal rules and regulations [Approved in Vienna (Austria) - August 24, 2007]

UNESCO

Mexico City Declaration on Cultural Policies, adopted by the World Conference on Cultural Policies, Mexico, 6 August 1982

Other institutions

Spanish Government

LEY 16/1985, de 25 de junio, del Patrimonio Histórico Español [Boletín Oficial del Estado de 29 de junio de 1985]

Annexes

Annex 1.- Institutions and websites for each stage of the research

Institutions of the website analysis stage of the research			
Name of the institution	**Website address**	**Country**	**Analysis date**
1853 Gallery Salts Mills	http://www.saltsmill.org.uk/	UK	25/02/2008
1950s Park Forest House Museum	http://parkforesthistory.org/HisSociety-website/HisSociety-website/index.sh	USA	01/02/2008
Abbe Museum	http://www.abbemuseum.org/	USA	01/02/2008
Aberdeen Art Gallery & Museums	http://www.aagm.co.uk/	UK	25/02/2008
Ackland Art Museum	http://www.ackland.org/index.php	USA	01/02/2008
Agricultural Heritage Museum	http://www.agmuseum.com/	USA	01/02/2008
Albin Polasek Museum and Sculpture Garden	http://www.polasek.org/	USA	01/02/2008
Albright-Knox Art Gallery	http://www.albrightknox.org/	USA	01/02/2008
Allen Memorial Art Museum	http://www.oberlin.edu/amam/	USA	01/02/2008
American Folk Art Museum	http://www.folkartmuseum.org/	USA	01/02/2008
American Swedish Historical Museum	http://www.americanswedish.org/	USA	01/02/2008
Amon Carter Museum	http://www.cartermuseum.org/	USA	01/02/2008
Arizona Historical Museum	http://www.arizonahistoricalsociety.org/	USA	01/02/2008
Arizona State Museum	http://www.statemuseum.arizona.edu/	USA	01/02/2008
Arizona State University Art Museum	http://asuartmuseum.asu.edu/	USA	01/02/2008
Art Institute of Chicago	http://www.artic.edu/aic/	USA	04/02/2008
Art Museum of the Americas	http://www.museum.oas.org/	USA	04/02/2008
ARTIUM - Museo de Arte Contemporáneo	http://www.artium.org	Spain	29/01/2008
Ashmolean Museum of Art and Archaeology	http://www.ashmolean.org/	UK	26/02/2008

BAM/PFA	http://www.bampfa.berkeley.edu/	USA	04/02/2008
Bath Postal Museum	http://www.bathpostalmuseum.co.uk/	UK	25/02/2008
Benaki Museum	http://www.benaki.gr/	Greece	12/03/2008
Berlinische Galerie	http://www.berlinischegalerie.de/	Germany	09/03/2008
Bill Douglas Center for the History of Cinema and Popular Culture	http://www.ex.ac.uk/bdc/	UK	25/02/2008
Birmingham Museum of Art	http://www.artsbma.org/	USA	04/02/2008
Bob Jones University Museum and Gallery	http://www.bjumg.org/	USA	04/02/2008
Bolton Museum	http://www.boltonmuseums.org.uk/	UK	25/02/2008
Bowers Museum of Cultural Art	http://www.bowers.org/	USA	04/02/2008
Brauer Museum of Art	http://www.valpo.edu/	USA	04/02/2008
British Museum	http://www.britishmuseum.org/default.aspx	UK	26/02/2008
Brooklyn Museum of Art	http://www.brooklynmuseum.org/	USA	04/02/2008
Brooks Museum of Art	http://www.brooksmuseum.org/	USA	04/02/2008
Canajoharie Art Gallery	http://www.arkellmuseum.org/	USA	06/02/2008
Castillo de Ampudia - Colección Eugenio Fontaneda	http://www.castillodeampudia.com	Spain	28/01/2008
Catedral de León	http://www.catedraldeleon.org/	Spain	28/01/2008
Center for the Study of Cartoons and Caricature	http://library.kent.ac.uk/cartoons/	UK	25/02/2008
Cheltenham Art Gallery and Museum	http://www.cheltenhammuseum.org.uk/	UK	25/02/2008
Chertsey Museum	http://ww2.runnymede.gov.uk/leisure/indoors/chertsey/welcome.htm	UK	25/02/2008
Cincinnati Art Museum	http://www.cincinnatiartmuseum.com/	USA	06/02/2008
Cleveland Museum of Art	http://www.clevelandart.org/	USA	06/02/2008
Columbia Museum of Art	http://www.columbiamuseum.org/	USA	06/02/2008
Contemporary Museum	http://www.tcmhi.org/	USA	06/02/2008
Corcoran Gallery of Art	http://www.corcoran.org/	USA	06/02/2008
Corinium Museum	http://www.cotswold.gov.uk/	UK	25/02/2008

Currier Gallery of Art	http://www.currier.org/	USA	06/02/2008
Dahesh Museum	http://www.daheshmuseum.org/	USA	06/02/2008
Daum Museum of Contemporary Art	http://www.daummuseum.org/	USA	06/02/2008
Delaware Art Museum	http://www.delart.org/	USA	06/02/2008
Denver Art Museum	http://www.denverartmuseum.org/	USA	06/02/2008
Detroit Institute of Arts	http://www.dia.org/	USA	06/02/2008
Deutsches Historiches Museum	http://www.dhm.de/	Germany	09/03/2008
Deutsches Museum	http://www.deutsches-museum.de/	Germany	09/03/2008
Deutsches Uhrenmuseum	http://www.deutsches-uhrenmuseum.de/	Germany	09/03/2008
Dickens House Museum$	http://www.dickensmuseum.com/	UK	25/02/2008
Egypt Centre	http://www.swan.ac.uk/egypt/	UK	25/02/2008
Everson Museum of Art	http://www.everson.org/	USA	07/02/2008
Farnsworth Art Museum	http://farnsworthmuseum.org/	USA	07/02/2008
Fitzwilliam Museum	http://www.fitzmuseum.cam.ac.uk/	UK	25/02/2008
Folger Shakespeare Library	http://www.folger.edu/	USA	07/02/2008
Freilichtmuseen Massing und Finsterau	http://www.freilichtmuseum.de/	Germany	10/03/2008
Freud Museum	http://www.freud.org.uk/	UK	25/02/2008
Fundación Eugenio Granell	http://www.fundacion-granell.org	Spain	28/01/2008
Fundación Gala-Salvador Dalí	http://www.salvador-dali.org/es_index.html	Spain	28/01/2008
Fundación Lázaro Galdiano	http://www.flg.es	Spain	28/01/2008
Fundación Telefónica - Arte y Tecnología	http://www.fundacion.telefonica.com/arte_tecno/index.html	Spain	28/01/2008
Gainsborough's House	http://www.gainsborough.org/	UK	25/02/2008
Germanisches Nationalmuseum	http://www.gnm.de/	Germany	10/03/2008
Getty Museum	http://www.getty.edu/	USA	07/02/2008
Gibbes Museum	http://www.gibbes.com/	USA	07/02/2008
Government Art Collection	http://www.gac.culture.gov.uk/home/index.asp	UK	26/02/2008

Grace Museum	http://www.thegracemuseum.org/	USA	07/02/2008
Guggenheim Museum	http://www.guggenheim.org/	USA	07/02/2008
Haggerty Museum of Art	http://www.marquette.edu/haggerty/	USA	14/02/2008
Hallie Ford Museum of Art	http://www.willamette.edu/	USA	07/02/2008
Hamphire Museums Service	http://www3.hants.gov.uk/museum	UK	25/02/2008
Harvard University Museums	http://www.artmuseums.harvard.edu/	USA	07/02/2008
Haus der Geschichte der Bundesrepublik Deutschland	http://www.hdg.de/	Germany	11/03/2008
Hellenic Ministry of Culture	http://odysseus.culture.gr/	Greece	12/03/2008
Henry Moore Foundation	http://www.henry-moore-fdn.co.uk/	UK	25/02/2008
Herbert F. Johnson Museum of Art	http://www.museum.cornell.edu/	USA	07/02/2008
Hickory Museum of Art	http://www.hickorymuseumofart.org/	USA	07/02/2008
High Museum of Art	http://www.high.org/	USA	07/02/2008
Hilo Art Museum	http://www.hiloartmuseum.org/	USA	07/02/2008
Historic New Orleans Collection	http://www.hnoc.org/	USA	07/02/2008
Historical Museum of Southern Florida	http://www.hmsf.org/	USA	07/02/2008
Homepage der Lutherhalle	http://www.martinluther.de/	Germany	11/03/2008
Honolulu Academy of Art	http://www.honoluluacademy.org/	USA	07/02/2008
Hunterian Museum and Art Gallery	http://www.huntsearch.gla.ac.uk/	UK	26/02/2008
Imperial War Museum	http://www.iwm.org.uk/	UK	26/02/2008
Inverness Museum and Art Gallery	http://inverness.highland.museum/	UK	26/02/2008
Isamu Noguchi Museum	http://www.noguchi.org/	USA	07/02/2008
Jewish Museum	http://www.jewishmuseum.org.uk/	UK	26/02/2008
Jewish Museum of Maryland	http://www.jhsm.org/	USA	07/02/2008
Joslyn Art Museum	http://www.joslyn.org/	USA	11/02/2008
Kemper Museum of Contemporary Art	http://www.kemperart.org/	USA	11/02/2008
Kimbell Art Musem	http://www.kimbellart.org/	USA	11/02/2008

Kunsthalle Bremen	http://www.kunsthalle-bremen.de/	Germany	11/03/2008
Kunstmuseum	http://www.kunstmuseum-wolfsburg.de/	Germany	11/03/2008
Kunstsammlung NordRhein-Westfalen	http://www.kunstsammlung.de/	Germany	11/03/2008
Lancashire Museums	http://www.lancashire.gov.uk/education/museums/	UK	26/02/2008
Leicester City Museum	http://www.leicestermuseums.ac.uk/museums/	UK	26/02/2008
Leigh Yawkey Woodson Art Museum	http://www.lywam.org/	USA	11/02/2008
Leighton House Museum	http://www.rbkc.gov.uk/LeightonHouseMuseum/general/	UK	26/02/2008
Lenbachhaus	http://www.lenbachhaus.de/	Germany	11/03/2008
Lightner Museum	http://www.lightnermuseum.org/	USA	11/02/2008
Longview Museum of Fine Arts	http://www.lmfa.org/	USA	11/02/2008
Los Angeles County Museum of Art	http://www.lacma.org	USA	11/02/2008
Loyola University Museum of Art	http://www.luc.edu/luma/	USA	11/02/2008
Ludwigforum für International Kunst	http://www.ludwigforum.de/	Germany	11/03/2008
Maidstone Museum	http://www.museum.maidstone.gov.uk/	UK	26/02/2008
Maine Historical Society	http://mainehistory.pastperfect-online.com/	USA	06/02/2008
Manchester Art Galleries	http://www.manchestergalleries.org/	UK	26/02/2008
Marischal Museum	http://www.abdn.ac.uk/marischal_museum/	UK	26/02/2008
Meadows Museum	http://www.meadowsmuseumdallas.org/	USA	12/02/2008
Memorial Art Gallery	http://magart.rochester.edu/	USA	12/02/2008
Metropolital Museum of Art	http://www.metmuseum.org/	USA	12/02/2008
Miami Art Museum	http://www.miamiartmuseum.org/	USA	12/02/2008
Milwaukee Art Museum	http://www.mam.org	USA	12/02/2008
Minneapolis Institute of Arts	http://www.artsmia.org/	USA	12/02/2008
Minnesota Museum of American Art	http://www.mmaa.org/	USA	12/02/2008
Mint Museum of Art	http://www.themintmuseums.org/	USA	12/02/2008
Missoula Art Museum	http://www.missoulaartmuseum.org/	USA	12/02/2008

MoMA	http://www.moma.org/	USA	13/02/2008
Montclair Art Museum	http://www.montclairartmuseum.org/	USA	13/02/2008
Morris Museum of Art	http://www.themorris.org/	USA	13/02/2008
Museo Arqueológico Nacional	http://man.mcu.es	Spain	29/01/2008
Museo Bellas Artes Bilbao	http://www.museobilbao.com/	Spain	29/01/2008
Museo Chillida-Leku	http://www.eduardo-chillida.com	Spain	29/01/2008
Museo de Arte Contemporáneo de Barcelona	http://www.macba.es	Spain	29/01/2008
Museo de Arte de Puerto Rico	http://www.mapr.org/	USA	13/02/2008
Museo de Bellas Artes San Pío V	http://www.cult.gva.es/mbav	Spain	29/01/2008
Museo de León	http://turismo.iranon.org/museodeleon/	Spain	29/01/2008
Museo de Navarra	http://www.cfnavarra.es/cultura/museo/eng/textos/museo.html	Spain	29/01/2008
Museo de Tudela	http://www.ciudadtudela.com/decanal	Spain	29/01/2008
Museo del Niño	http://www.museodelnino.es/	Spain	29/01/2008
Museo Diocesano de Tarragona	http://museu.diocesa.arquebisbattarragona.cat/	Spain	29/01/2008
Museo Guggenheim Bilbao	http://www.guggenheim-bilbao.es/	Spain	29/01/2008
Museo Nacional Arqueològic de Tarragona	http://www.mnat.es	Spain	29/01/2008
Museo Nacional de Arte de Catalunya	http://www.mnac.es	Spain	29/01/2008
Museo Nacional de Escultura	http://museoescultura.mcu.es/	Spain	29/01/2008
Museo Nacional del Prado	http://www.museodelprado.es	Spain	29/01/2008
Museo Nacional Reina Sofia	http://www.museoreinasofia.es	Spain	29/01/2008
Museo Naval de Madrid	http://www.museonavalmadrid.com/	Spain	29/01/2008
Museo Patio Herreriano - Arte Contemporáneo Español	http://www.museopatioherreriano.org /	Spain	29/01/2008
Museo Thyssen-Bornemisza	http://www.museothyssen.org/thyssen/	Spain	29/01/2008
Museo Vostell de Arte Contemporáneo	http://www.museovostell.org	Spain	29/01/2008
Museo Zuloaga	http://www.ignaciozuloaga.com/	Spain	29/01/2008
Museo Zumalakarregi	http://zm.gipuzkoakultura2.net/presentacion.php?op=1&act=1	Spain	29/01/2008

Museu d'Art de Girona	http://www.museuart.com	Spain	29/01/2008
Museu Frederic Mares	http://www.museumares.bcn.es/	Spain	29/01/2008
Museum Folkwang	http://www.museum-folkwang.de/	Germany	11/03/2008
Museum für Kunst und Gewerbe	http://www.mkg-hamburg.de/	Germany	11/03/2008
Museum of Archaeology and Anthropology	http://museum-server.archanth.cam.ac.uk/	UK	26/02/2008
Museum of Art of Fort Worth	http://www.mamfw.org/	USA	13/02/2008
Museum of Contemporary Art	http://www.mcachicago.org/	USA	13/02/2008
Museum of Contemporary Art of Georgia	http://www.mocaga.org/	USA	13/02/2008
Museum of Contemporary Art of San Diego	http://www.mcasd.org/	USA	13/02/2008
Museum of English Rural Life	http://www.ruralhistory.org/index.html	UK	26/02/2008
Museum of Fine Arts	http://www.mfa.org/	USA	13/02/2008
Museum of Fine Arts	http://mfah.org/	USA	13/02/2008
Museum of Modern Art of Wales	http://home2.btconnect.com/MOMAWALES/english/index.htm	UK	26/02/2008
National Galleries of Scotland	http://www.nationalgalleries.org/	UK	26/02/2008
National Gallery	http://www.nationalgallery.org.uk/	UK	26/02/2008
National Gallery of Art	http://www.nga.gov/	USA	13/02/2008
National Museum of Photography, Film & Television	http://www.nationalmediamuseum.org.uk/	UK	26/02/2008
National Museum Wales	http://www.museumwales.ac.uk/	UK	25/02/2008
National Museums of Scotland	http://nms.scran.ac.uk/	UK	26/02/2008
National Portrait Gallery	http://www.npg.org.uk/	UK	26/02/2008
Nelson-Atkins Museum of Art	http://www.nelson-atkins.org/	USA	13/02/2008
Norfolk Museum and Archaeology Service	http://www.museums.norfolk.gov.uk/	UK	25/02/2008
North Carolina Museum of Art	http://ncartmuseum.org/	USA	13/02/2008
Oriental Institute Museum	http://oi.uchicago.edu/	USA	13/02/2008
Pasarya Museum of Art	http://www.pasaryamuseum.org/	USA	14/02/2008
Pennsylvania Academy of Fine Arts	http://www.pafa.org/	USA	14/02/2008

Petrie Museum of Egyptian Archaeology	http://www.petrie.ucl.ac.uk/index2.html	UK	26/02/2008
Philadelphia Museum of Art	http://www.philamuseum.org/	USA	14/02/2008
Pilgrim Gall Museum	http://www.pilgrimhall.org/	USA	14/02/2008
Pitt Rivers Museum	http://www.prm.ox.ac.uk/	UK	26/02/2008
Portland Museum of Art	http://www.portlandmuseum.org/	USA	14/02/2008
Reynolda House Museum of American Art	http://www.reynoldahouse.org/	USA	14/02/2008
Ribchester Roman Museum	http://www.ribchestermuseum.org/	UK	26/02/2008
Richmond Art Museum	http://www.richmondartmuseum.org/	USA	14/02/2008
Roman Baths Museum	http://www.romanbaths.co.uk/	UK	26/02/2008
Rosicrucian Egyptian Museum	http://www.egyptianmuseum.org/	USA	14/02/2008
Royal Academy of Arts	http://www.royalacademy.org.uk/	UK	26/02/2008
Royal Collections	http://www.royalcollection.org.uk/	UK	26/02/2008
Sainsbury Centre for Visual Arts	http://www.scva.org.uk/	UK	26/02/2008
San Francisco Museum of Modern Art	http://www.sfmoma.org	USA	14/02/2008
Sheldon Memorial Art Gallery	http://www.sheldonartgallery.org/	USA	14/02/2008
Sleaford Museum	http://sleafordmuseum.org.uk/	UK	26/02/2008
Smith College Museum of Art	http://www.smith.edu/artmuseum/	USA	14/02/2008
Springville Museum of Art	http://springvilleartmuseum.org/	USA	14/02/2008
Staatliche Kunsthalle	http://www.kunsthalle-karlsruhe.de/	Germany	11/03/2008
Staatliche Museen Kassel	http://www.museum-kassel.de/	Germany	11/03/2008
Staatsgalerie	http://www.staatsgalerie.de/	Germany	11/03/2008
Städel-Museum	http://www.staedelmuseum.de/	Germany	11/03/2008
Swansea Heritage	http://www.swanseaheritage.net/	UK	26/02/2008
Tacoma Art Museum	http://www.tacomaartmuseum.org/	USA	14/02/2008
Tampa Museum of Art	http://www.tampagov.net/dept_tampa_museum_of_art/	USA	14/02/2008
Tate	http://www.tate.org.uk/	UK	26/02/2008

The Historical Society of Pennsylvannia	http://www.hsp.org/	USA	04/02/2008
Timken Museum of Art	http://www.timkenmuseum.org/	USA	14/02/2008
Toledo Museum of Art	http://www.toledomuseum.org/	USA	14/02/2008
Tyne & Wear Museums	http://www.twmuseums.org.uk/	UK	26/02/2008
Ulster Museum	http://www.ulstermuseum.org.uk/	UK	26/02/2008
University of Kentucky Art Museum	http://www.uky.edu/ArtMuseum/	USA	14/02/2008
University of Michigan Museum of Art	http://www.umma.umich.edu/	USA	14/02/2008
Ure Museum of Classical Archaeology	http://www.rdg.ac.uk/Ure/index.php	UK	26/02/2008
Utah Museum of Fine Arts	http://www.umfa.utah.edu/	USA	14/02/2008
Victoria and Albert Museum	http://www.vam.ac.uk/	UK	26/02/2008
Virginia Museum of Fine Arts	http://www.vmfa.state.va.us/	USA	14/02/2008
Wallace Collection	http://www.wallacecollection.org/	UK	26/02/2008
Walter Anderson Museum of Art	http://www.walterandersonmuseum.org/	USA	14/02/2008
Walters Art Museum	http://www.thewalters.org/	USA	14/02/2008
Westmoreland Museum of American Art	http://www.wmuseumaa.org/	USA	14/02/2008
Whitworth Art Gallery	http://www.whitworth.manchester.ac.uk/	UK	26/02/2008
Wichita Art Museum	http://wichitaartmuseum.org/	USA	14/02/2008
Württembergisches Landesmuseum	http://www.landesmuseum-stuttgart.de/	Germany	11/03/2008
York Museums Trust	http://www.yorkmuseumstrust.org.uk/	UK	26/02/2008

Institutions of the global weblog analysis stage of the research		
Name of the institution	**Website address**	**Country**
Benaki Museum	http://www.benaki.gr/	Greece
Diocesan and Regional Museum of Lleida	http://oliba.uoc.edu/mlldc/index.php	Spain
Pitt Rivers Museum	http://www.prm.ox.ac.uk/	UK

Institution of the individual weblog analysis stage of the research		
Name of the institution	**Analysed website address**	**Country**
Pitt Rivers Museum	http://www.prm.ox.ac.uk/databases.html	UK

Annex 2.- Museums' websites analysis template

Profile of the institution

Name of the institution: _____

Address of the institution: _____

Country of the institution: _____

URL of the website analysed: _____

Date of the analysis: ____/__/__

Type of museum

- ☐ Art museum
- ☐ History museum
- ☐ Anthropology museum
- ☐ Archaeology museum
- ☐ Cultural site
- ☐ Natural museum
- ☐ Other (specify) _____

1.- Digital resources

Does the institution display any digital resources on the website?

- ☐ Yes
- ☐ No *(disregard the case for further analysis)*

2.- Type of digital resources

What kind of digital resources does the institution present

- ☐ Digital collection *(do not answer section 7)*
- ☐ Educational resources *(go directly to section 7)*
- ☐ Both of them

3.- Digitized objects

What kind of digitized objects does the institution present (multiple choice possible)

- ☐ Paintings
- ☐ Manuscripts
- ☐ Photographs
- ☐ Sculptures
- ☐ Decorative arts, jewellery
- ☐ Ritual objects, religious objects
- ☐ Daily life objects
- ☐ Magazines, books
- ☐ Other (specify) _____

4.- Searching tools

Does the institution have any searching tool? If so, degree and type of the searching tool

- ☐ None
- ☐ Simple
- ☐ Advanced
- ☐ Complex
- ☐ Combined
- ☐ Other (specify) _____

- ☐ Textual
- ☐ Graphical
- ☐ Combined
- ☐ Other (specify) _____

5.- Digital collection

Presentation of the digital collection (multiple choice possible)

- ☐ Catalogues
- ☐ Databases
- ☐ Highlights
- ☐ Collection
- ☐ Digital exhibitions
- ☐ Virtual museum
- ☐ Reconstructions
- ☐ Immersive environments
- ☐ Other (specify) _____

6.- Presentation of the contents of the digital collection

Presentation of the contents (multiple choice possible)

- ☐ Image
- ☐ Label
- ☐ Explaining text
- ☐ Author details
- ☐ Contextualization
- ☐ Image zoom
- ☐ Links to related works
- ☐ Links to related news
- ☐ Other (specify) _____

7.- Educational resources

Contents of the educational resources section of the website (multiple choice possible)

- ☐ Schedule and contact information
- ☐ Publications
- ☐ In-situ downloadable activities
- ☐ Virtual activities
- ☐ Edutainment activities
- ☐ Other (specify) _____

Remarks, observations, comments

Annex 3.- Structure of the weblogs analysis of the database section of the Pitt Rivers Museum

- User profile
    - IP address [IP]
    - Country of origin of the IP address [Country]
        - 1 Algeria
        - 2 Argentina
        - 3 Australia
        - 4 Austria
        - 5 Bahamas
        - 6 Barbados
        - 7 Belgium
        - 8 Bosnia
        - 9 Brazil
        - 10 Bulgaria
        - 11 Canada
        - 12 Chile
        - 13 China
        - 14 Colombia
        - 15 Cook Islands
        - 16 Cyprus
        - 17 Czech Republic
        - 18 Denmark
        - 19 Egypt
        - 20 Europe
        - 21 Fiji
        - 22 Finland
        - 23 France
        - 24 French Polynesia
        - 25 Georgia
        - 26 Germany
        - 27 Greece
        - 28 Guam
        - 29 Guatemala
        - 30 Hong Kong
        - 31 Hungary
        - 32 India
        - 33 Indonesia
        - 34 Iran
        - 35 Ireland
        - 36 Israel
        - 37 Italy
        - 38 Jamaica
        - 39 Japan
        - 40 Kenya
        - 41 Kuwait
        - 42 Latvia
        - 43 Lithuania
        - 44 Malaysia

        - 45 Malta
        - 46 Mexico
        - 47 Mongolia
        - 48 Morocco
        - 49 N/A
        - 50 Netherlands
        - 51 New Caledonia
        - 52 New Zealand
        - 53 Nigeria
        - 54 Norway
        - 55 Oman
        - 56 Papua New Guinea
        - 57 Philippines
        - 58 Poland
        - 59 Portugal
        - 60 Qatar
        - 61 Romania
        - 62 Russian Federation
        - 63 Satellite
        - 64 Saudi Arabia
        - 65 Serbia
        - 66 Singapore
        - 67 Slovenia
        - 68 Solomon Islands
        - 69 South Africa
        - 70 South Korea
        - 71 Spain
        - 72 Sri Lanka
        - 73 Sweden
        - 74 Switzerland
        - 75 Syria
        - 76 Taiwan
        - 77 Thailand
        - 78 Turkey
        - 79 Uganda
        - 80 UK
        - 81 Ukraine
        - 82 United Arab Emirates
        - 83 USA
        - 84 Vanuatu
        - 85 Venezuela
        - 86 Vietnam
    - Continent of access of the IP [Continent]
        - 1 Europe
        - 2 North America
        - 3 South America
        - 4 Asia
        - 5 Africa
        - 6 Oceania
        - 7 Satellite

        - 9 N/A
    - Type of visitor [Visitor]
        - 1 Private
        - 2 University, Superior education centres
        - 3 Oxford University
        - 4 Museum
        - 5 Education and learning organisation or networks
        - 6 Public or governmental institutions
        - 7 Means of communication
        - 8 Other
        - 9 N/A
- Duration of visit
    - Minimum total duration of stay of IP address in seconds [Duration]
- Access to the database section
    - Access via home [Home]
        - 0 No
        - 1 Yes
    - Frequency of access via home [FHome]
    - Number of access via home [NHome]
- Start of databases of the section
    - Start of database [Start]
        - 0 No
        - 1 Yes
    - Frequency of start of database [FStart]
    - Number of start of database [NStart]
    - Repetition of the start of a database during the same session [RStart]
        - 0 No
        - 1 Yes
        - 2 N/A
    - Repetition of the start of a database on different sessions [SStart]
        - 0 No
        - 1 Yes
        - 2 N/A
    - Database started [DStart]
        - 0 N/A
        - 1 Objects
        - 2 Photos
        - 3 Both
        - 4 Others
- Open of a record
    - Use of the open option [Open]
        - 0 No
        - 1 Yes
    - Frequency of the open of a record [FOpen]
    - Number of the open of a record [NOpen]
    - Repetition of the open of a record during the same session [ROpen]
        - 0 No
        - 1 Yes
        - 2 N/A
    - Repetition of the open of a record on different sessions [SOpen]

        - 0 No
        - 1 Yes
        - 2 N/A
    - Identification of the open of a record option [IOpen]
        - 0 N/A
        - 1 Open
        - 2 Open sort
        - 3 Both
- Performance of searches
    - Use of the searching option [Load]
        - 0 No
        - 1 Yes
    - Frequency of search [FLoad]
    - Number of searches [NLoad]
    - Repetition of searches during the same session [RLoad]
        - 0 No
        - 1 Yes
        - 2 N/A
    - Repetition of searches on different sessions [SLoad]
        - 0 No
        - 1 Yes
        - 2 N/A
    - Database used to perform searches [DLoad]
        - 0 N/A
        - 1 Objects
        - 2 Photos
        - 3 Both
        - 4 Others
- Navigation between records
    - Use of the navigation between records option [Navig]
        - 0 No
        - 1 Yes
    - Frequency of navigation between records [FNavig]
    - Number of pages viewed [NNavig]
    - Repetition of the navigation between records during the same session [RNavig]
        - 0 No
        - 1 Yes
        - 2 N/A
    - Repetition of the navigation between records on different sessions [SNavig]
        - 0 No
        - 1 Yes
        - 2 N/A
    - Number of next records [NeNavig]
    - Number of previous records [PreNavig]
- Direct search of a record in the database
    - Use of the direct search [Goto]
        - 0 No
        - 1 Yes
    - Frequency of the direct search [FGoto]
    - Number of direct searches [NGoto]

    - Repetition of direct searches during the same session [RGoto]
        - 0 No
        - 1 Yes
        - 2 N/A
    - Repetition of direct searches on different sessions [SGoto]
        - 0 No
        - 1 Yes
        - 2 N/A
    - Identification of the direct search [IGoto]
        - 0 N/A
        - 1 Record number
        - 2 Record by ID
        - 3 Both
    - Number of direct searches by record number [NuGoto]
    - Number of direct searches by record ID [IDGoto]
- Change of the viewing option
    - Use of the option to change the template [View]
        - 0 No
        - 1 Yes
    - Frequency of the change of view [FView]
    - Number of the change of view [NView]
    - Repetition of the change of view during the same session [RView]
        - 0 No
        - 1 Yes
        - 2 N/A
    - Repetition of the change of view on different sessions [SView]
        - 0 No
        - 1 Yes
        - 2 N/A
    - Identification of the change of view [IView]
        - 0 N/A
        - 1 Table
        - 2 Form
        - 3 List
        - 4 Table+Form
        - 5 Table+List
        - 6 Form+List
        - 7 Three of them
    - Number of use of the table option [TView]
    - Number of use of the form option [FOView]
    - Number of use of the list option [LView]