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2 EXECUTIVE SUMMARY

Deliverable D6.1 is interconnected with the Deliverable D6.2, due to be completed in Month 24, covering 3 regions in three EU countries - Greece, Spain and Cyprus - that have passed through a deep economic and social crisis during recent years. The study aims to analyse the relationship between the objectives of institutional policies through the development, support, and implementation of digital cultural projects, and their economic and social impact in various sectors.

D6.1. is based on the understanding of the various sectors, as they have been analysed by the experts in *D3.2 Seven TA Working Group Composite Reports*. and particularly the results of the Working Group 5.3 on users and sectors, models of governance, decision-making process and assessment of projects' success and impact.

D6.1 aims to:

- Identify the key sectors related to Digital Cultural Heritage, heir evolution in recent years and their potential.
- Create a framework for understanding the overall socioeconomic environment in which DCH has been developed in the 3 regions.
- Provide an economic and social environment analysis which establishes a solid base for the D6.2 analysis of concrete policies, stakeholders' interactions, responsibilities, legal framework etc
- Outline the methodological process of a Micro and Macro approach, applied to the case studies in D6.1 and further adapted in D6.2.
- Provide an initial mapping of real DCH projects in order to identify existing applications in the 3 regions, which illustrate the variety of content and the real digital heritage dynamic in each region, in relation to the overall environment and sectors and the extent of penetration of DCH into the cultural sector. In addition to giving an understanding the sectors and their socioeconomic environment, they also provide a first pool for the applications that will be further micro analysed in D6.2 depending on the availability of useful data for the purposes of the work.
- In addition, presents ViMM Decision Making Process (DMP) principles that will be used as a structuring tool in the micro level analysis in D6.2 and the also on a selection of the exemplary excellence cases on the ViMM Platform, where it will be integrated as an online Decision Making Tool (DMT).

2.1 ROLE OF THIS REPORT IN THE PROJECT

The overall objectives of the work in WP6 are:

- To extend the outcomes of ViMM as far as possible to influence thinking and policies for economic growth, by creating realistic exemplifications in regions of Europe within 3 Mediterranean countries, affected by the crisis, and having significant cultural assets, namely Cyprus, Greece, Spain, which clearly stand to gain from investment in VM and CH in general.
- As foreseen in the Description of Activities, WP6 will extend the outcomes of ViMM as far as possible to influence thinking and policies for economic growth, by creating realistic exemplifications in areas of Europe, particularly example regions of Greece, Spain, and Cyprus, in order to illustrate in practical terms, the benefits to be gained in specific target sectors of demand such as smart cities, creative industries, tourism, education and research and management.



2.2 STRUCTURE AND METHODOLOGICAL APPROACH OF THE DOCUMENT

The study follows 2 different and complementary levels of approach: macro and micro level analysis:

The Decision Making Process (DMP)

The micro and the macro level integrated analysis consists of studying data and information at the macro socioeconomic level as well as at the micro level of representative and interesting cases, in order to provide a holistic understanding of the big picture of DCH interaction, output and positioning in the economy and society and to extract coherent and valid conclusions. This framework will be implemented in the next period for the full development of the study as foreseen, in D6.2, due in M24.

Aspects of the Macro level presented in D.6.1

- The main policy fields and the basic intuitional structure of the 3 regions.
- The overall evolution of the 3 selected regions during recent years, their overall economic situation, challenges and opportunities and the potential of cultural heritage.
- Qualitative and quantitative data based approaches of the various sector's key players related with DCH, identifying the main issues and challenges for each sector in relation to this.
- The 4 stages of the Decision Making Process (DMP) as they have been elaborated by the experts in Thematic Area (TA5), to be used in D6.1. and D6.2, where possible, as a structuring method and hen completed as an independent DMT integrated on the ViMM platform. Once fully developed this approach will be applied to a selection of the remaining Excellence studies on the Platform.

Aspects of the Micro level presented in D.6.1. are

- An initial exploration in order to identify some representative existing Digital Cultural applications in the 3 regions, which illustrate the variety of DCH content and the real digital heritage dynamic in each region and could form a first mapping of the kinds of existing and exemplary applications implemented in each area.
- A first pool for the applications that will be further analysed in D6.2 within the micro analysis, depending in the availability of useful data for the purposes of the work.

3 THE DECISION MAKING PROCESS (DMP)

The 4-stage DMP process was developed by ViMM experts following the work done in Thematic Area 5 - Demand. It is extensively presented in the outputs of the TA and is currently under codification and integration as on-line tool, designed to provide a useful planning and monitoring tool for digital heritage projects kinked to a pool of self-sustained resources and experts that could improve quality and cost-efficient project conception, design implementation and sustainable operation in the field of DCH, involving competent internal and external socioeconomic stakeholders.

It is also for use as a structured concept of understanding and analysis of each DCH project, and as a tool for the identification of obstacles, misunderstandings or missing elements in the decision process.

The process of each digital heritage project is conceived as 4 stages, each one of which should achieve a certain level of maturity in order to optimise decisions, following rational planning. Each level requires resources, expertise, know-how and internal and external experts as well as social involvement. It is also necessary to have established processes for the participation of the stakeholders in the project, together with access to the decision maker.

The 4 stages are as follows:

1. Idea generation, initial vision and objectives

- Cultural assets converted or created in digital form
- Policy making actors/ stakeholders possibly involved in the project idea generation internally and externally, in relation to regional development policy objectives.
- Decisions taken at this stage and overall objectives, support and enhancement by development policies in financial terms, resources, information, and know-how provision.
- Targeted sectors (tourism, smart cities, branding, leisure, education, research, conservation and preservation)

2. Project design

- Policy making actors/stakeholders involved in project design, alignment with local development and growth policies and local social demands.
- Financial resources available for project design, know-how networks available, obstacles and opportunities.

3. Project implementation

- Policy making actors/ stakeholders involved in project implementation, local society involvement and benefits/impact, alignment with local development and growth policies and local social demands.
- Financial resources available for the project implementation, know-how networks available, obstacles and opportunities

4. Project operation and evaluation

- Policy making actors/ stakeholders implications and benefits through digital cultural project operation, local social involvement and benefits/impacting the respective sectors.
- Financial resources available for project operation, income and expenses, business plan assessment, direct and indirect economic returns and benefits to the project owner, internal and external adaptation, impact evaluation, evolution of the project, new projects extensions, maintenance, and feeding new projects in terms of concepts and reusable content and technologies.



4 THE MACRO LEVEL IN THE 3 REGIONS: KEY INSTITUTIONAL STAKEHOLDERS

4.1 CATALONIA/ SPAIN INSTITUTIONAL: KEY INSTITUTIONAL STAKEHOLDERS

- Central Government
- Regional Government agencies (Ministry of Culture, Ministry of Regional Development)
- The “Diputaciones”
- The Municipalities

In the above-mentioned context, UPF has established a partnership within the ViMM project with the relevant agencies of the **Generalitat** cultural departments (local government). Various contacts and meetings have been held with the services of Archives, Technology Development Agency (Regional administration, agencies and departments in charge of various aspects of cultural and digital policy), Municipality administrations and individual Museums, mentioned below in the specific cases. Their personnel have strongly supported ViMM team’s efforts to date, providing access to relevant information and issuing supportive instructions directives to the supervised museums and cultural institutions in order to facilitate and support ViMM.

Working meetings have been organised with a number of local government departments who are providing available information and support for the project research as stated in the initial letter of support and collaboration, including:

Department of Culture

- General Directorate of the Cultural heritage of Catalonia / Service of Museums and protection of mobile cultural heritage (Direction General del Patrimoni Cultural Servei de Museus i Protecció de Béns Mobles): supervising the public museums of the area.
- Service of Information and cultural Diffusion / Servei d’Informació i Difusió Cultural (in charge of the technologies selection support)
- Technical Support Services and Archives / Servei de Suport Tècnic i Inventari (in charge of digitisation and archives)

Within the institutional contact framework, ViMM’s researchers have also contacted key persons in the Municipality of Barcelona in the design and development of digital heritage projects, who had already participated in the project’s expert team.

Additionally, the University Pompeu Fabra has established collaboration with the Girona University of Tourism, in order to integrate the work undertaken in the current academic research work for Master’s Degree students in tourism and digital culture.

4.2 GREECE / CENTRAL MACEDONIA – THESSALONIKI : KEY INSTITUTIONAL STAKEHOLDERS

Central Government

- Ministry of Culture and Agencies (museums, archaeological Ephorates)
- Ministry of Education
- Ministry of Macedonia Thrace
- General Secretary of Research

Municipality of Thessaloniki

4.3 CYPRUS: KEY INSTITUTIONAL STAKEHOLDERS

Central Government

- Department of Antiquities



Municipalities

Research institutions

- Cyprus University of Technology
- University of Cyprus
- Cyprus institute

The Smart Specialisation Strategy for Cyprus was launched in 2015 as a conditionality during the programming period 2014-2020, for the exploitation of resources from the European Structural and Investment Funds for enhancing Research and Innovation (R & I) in areas where each country has a competitive advantage, identified its priority areas as: Energy, Tourism, the Structured Environment/Construction Industry, Transport/Marine, Agriculture/Food Industry and the sector of Health. Cultural Heritage has a key role to play in several of these areas.

Cyprus University of Technology (Digital Heritage Research Laboratory) was appointed UNESCO Chair of Digital Heritage in late 2017, providing significant potential for influencing the status of and investment in DCH in the years to come.

Also, in the second half of 2017, the government has established a new committee to develop strategies for DCH. As its first initiative, the committee has commissioned from consultants to be completed by the end of March 2018. The study will record the current situation regarding the digitisation of the cultural wealth of Cyprus, as well as an analysis of internationally applicable practices in this field. The study will result in submission of proposals for the Development of Actions for the exploitation of the cultural stock of Cyprus

The results of the study should demonstrate the priorities that the state needs to set in terms of digitization of the cultural heritage (e.g. digitization prioritization in religious tourism or other areas with added value to the country's economy). The analysis should have three levels of response: Now (by 2020), in the medium term (2025) and in the longer term (2030).

5 OVERALL SOCIOECONOMIC PRESENTATION OF THE 3 AREAS

5.1 CATALONIA/ SPAIN



Within this process the local partners worked in specific regions of the above mentioned countries in order to exemplify the study and access and elaborate data and information, such as digital initiatives, cultural assets, important of tourism, museums policies and investments, access to specific exemplification cases, various levels of stakeholders and actors .

More concretely in Spain the region of Catalunya, where UPF is located, was selected,. The region accounts for 19% of Spain's GDP, receives 24% of the total country's tourism inflow (17 million in 2016¹), disposes of one of the more active cultural industries in the country, as well as important cultural assets (museums, archeological sites, architecture, intangible heritage) with related attractions, concrete plans, and regional policies and investments in the cultural sector generally and more specifically in the field of museums and archaeological sites, as well as architectural heritage in relation tourban and rural development. However, the cultural sector suffered from a large reduction investment in culture during the period of crisis following the overall public spending reduction which resulted from the economic crisis which began a decade ago. The overall spending of the Spanish state for culture has been reduced from EUR 1100 Million in 2009 to around EUR 600 Million in 2014 ². Similarly the spending of the local government of Catalunya in the cultural sector declined from EUR 326 Million to 255 Million between 2011 and 2015 (museums from EUR 12 to 9 Million, archives from 10.9 to 10.05 Million, libraries from 26 to 22 Million, archeological sites and buildings from 12 to 9 Million). The reduction since then has been less severe and in some cases, investment recovered to previous levels in 2015³. Meanwhile, visitors to registered museums during the same period followed a similar pathway: 10.9 Million visits in 2011, 9,8 Million in 2013, then back to 10,9 million in 2015, and still rising. At the same time various initiatives in digital heritage have been applied across the whole field, from digitization of archives, digital access to museum collections, multimedia presentations, virtual visits, digital archives and conceptual collections, building on the available digital content, mobile applications etc. The combination of important digital assets, with high tourist flows, important research and digital infrastructures,⁴ a variety of digital applications and policies and many levels of policy makers makes the region an interesting case to study the effectiveness, the obstacles, the decision-making process in order to remove obstacles and maximise the impact of digital heritage policies and investments in economic growth.

5.2 GREECE / CENTRAL MACEDONIA / THESSALONIKI

The purpose of the study in Greece is the analysis of the investment, operation and impact of Virtual Multimodal Museums and digital applications in cultural heritage assets, in the region of northern Greece, specifically Central Macedonia. The results of this study are expected to contribute in defining the key sectors where DCH/VM have strong potential to impact economic growth and produce social benefits, to identify the 'institutional landscape' and to activate the interest of important stakeholders. The field that is going to be explored in the macro level ⁵, as well as the cases that are going to be analyzed in the micro level

¹ DATOS TURISMO 2016, Ministerio de Energia Turismo y agenda digital <http://www.minetad.gob.es/es-ES/GabinetePrensa/NotasPrensa/2017/Documents/TURESPA%C3%91A%20AVANCE%20CIERRE%202016.pdf>

² Anuario de estadísticas culturales 2016, principales resultados.

³ Estadísticas culturales de catalunya 2017

⁴ Strategies for digital European hub in Catalonia, <http://catalunya2020.gencat.cat/ca/inici/consulta/>

⁵ Regional case studies structure D6.1.docx (document describing the structure of the input for D6.1)



[1], are described below. The region of Central Macedonia includes important cultural assets such as the royal tombs of Macedon and the respective museum of Vergina⁶, very important large Ottoman and Byzantine Cultural heritage, within and around the city of Thessaloniki, the touristic areas of Chalkidiki peninsula and the Holy Mountain Athos.

The region of Central Macedonia represents 17% of Greece's population (2011). In 2014 the GDP of the region was 13.3% of the country's GDP (2014). The average GDP of the region was 78% of the average GDP of Greece. During the years of the crisis (2008 – 2013) the GDP of the region decreased by 26.5%, compared with - 24.7% in the entire country⁷. Meanwhile tourism has increased during the same period from 16 million visitors (2007), to 24 million visitors (2014). In 2016 Central Macedonia received alone 6.3 million tourists, mostly from Germany, UK and the neighbouring Balkan countries sustaining 50.000 jobs⁸. A large number of cultural assets have been targeted by visitors, and many digital applications have been planned developed and funded mainly through the European Structural Funds programs including the current one (ESPA 2014-2020⁹). A specific strategy for the development of cultural assets development in relation to regional development and intelligent specialisation has been elaborated and applied in the above-mentioned regional development program.

The cultural and creative industry in Greece, most of which concerns digital media, is the 4th in value in GDP (1.4%) and the second in number of employees (3.2%)¹⁰ This is due to continuous financial and institutional support, the acceptance of cultural actions and initiatives and the understanding of the opportunities offered.

Cultural projects are supported financially by state resources through regular and special funding, European Union programs and subventions and also by private sponsors. All of these projects concern either partially or entirely digital cultural heritage. These projects are both small scale and local, such as digital documentation, representation, promotion etc. and nationwide, such as digital cultural heritage infrastructure projects involving records, databases, GIS, archaeological cadaster etc.

Cultural heritage is directly related in Greece with entrepreneurship, competitiveness and innovation. Domains such as tourism, industry, education, real estate etc. are based on the dissemination, promotion and branding of cultural assets. Cultural projects proved to be multiplying (x 3.44) in the initial capital invested¹¹ in implementation and in operations benefiting local economies.

⁶<https://www.aigai.gr/en/explore/museum/palace/aiges/vergina>

⁷Τα αποτελέσματα της μεγάλης ύφεσης στους νομούς και τις περιφέρειες της Ελλάδος - Μία περιγραφική στατιστική ανάλυση με έμφαση στον τουρισμό Γρηγόρης Θ. Παπανίκος Πρόεδρος, Αθηναϊκό Ίδρυμα Παιδείας & Έρευνας (ΑΙΠΕ) Επίτιμος Καθηγητής Οικονομικών Επιστημών, Πανεπιστήμιο Στέρλινγκ, Η.Β. [https://www.atiner.gr/gtp/Papanikos\(2016\)-GDP-Lamia.pdf](https://www.atiner.gr/gtp/Papanikos(2016)-GDP-Lamia.pdf)

⁸ Source INSETE <http://www.insete.gr/el-gr/Dashboard/Στατιστικά/Στατιστικά-Στοιχεία>

⁹https://www.espa.gr/elibrary/Centr.Macedonia_2014GR16M2OP002_1_4_el.pdf

¹⁰Mapping the cultural and creative industries in Greece, 2016. www.artscouncilgreece.org/wp/wp-content/uploads/2017/06/cci-greece-en.pdf

¹¹UNESCO Diversity of Expressions. Greece 2016 report <https://en.unesco.org/creativity/monitoring-reporting/periodic-reports/available-reports-44>

5.3 CYPRUS



The purpose of the study in Cyprus is to assess the potential of recent initiatives to create strategies for digital cultural heritage on the island. Since its economic crisis in 2013, investment in this area has been low to non-existent. Nevertheless, the potential to leverage Cyprus' impressive Cultural Heritage for economic growth and social benefit is very large, along with its tourism industry. The island of Cyprus, exemplified by Pafos, has highly symbolic and world renowned heritage resources from the ancient pan-Mediterranean civilizations - Pharaonic, Phoenician,

Hellenistic, Roman, Byzantine, Venetian, Ottoman - capable of attracting international interest and producing good transferable examples. Cultural Heritage is a core asset of Cyprus and the surrounding region. Cyprus itself boasts well over a thousand Listed Monuments. The island is an open-air museum of prehistoric settlements, classical Greek temples, Roman theatres and villas, Early Christian basilicas, Byzantine churches and monasteries, Crusader castles, Gothic cathedrals, Venetian fortifications, Moslem mosques, and British colonial-style buildings. The old ways of life, customs and traditions are still preserved in the rural villages, and interesting elements of the island are captured in the many museums and galleries. Nevertheless, there has been considerable destruction and deterioration of monuments, principally in the North of the island, since it was divided in 1974.

The preventative conservation and reconstruction of damaged heritage will require large-scale inputs of expertise. Cultural Heritage can be a major resource for tourism, education, creativity and economic growth. Potential reunification of Cyprus provides scope for DCH applications in support of social cohesion. It is estimated that GDP grew at 3% in 2016 after a period of overall decline since 2008. Unemployment was estimated at 12.9%. The total number of tourists in Cyprus in 2017 was 3,652,073¹². The contribution of travel and tourism to GDP was 21.4 %, up from 19.4 % previous year. , Cyprus' tourism industry ranks 29th in the world in terms of overall competitiveness¹³. In terms of Tourism Infrastructure, in relation to the tourism industry Cyprus ranks 1st in the world. Much of the tourist industry relies on "sea sun and sand" to attract tourists. This reflects in the seasonal distribution of tourist arrivals with a disproportionate number arriving during the summer months. Whereas most eastern resorts like Protaras and Ayia Napa lie dormant in the winter months the west of the island remains open to tourism with the promotion of Cypriot history culture, art and specialized sports such as golf and tennis. The World Travel and Tourism Council 2016 report on the island outlines that the total investment in the Travel & Tourism industry in 2015 was EUR273.7mn, or 14.0% of the total investments. It projects a rise by 5.3% in 2016 and 2.9% pa over the next ten years to EUR384.6mn in 2026.

¹²<http://www.cyprustourism.news/9826/cyprus-sees-impressive-increase-in-tourist-arrivals-during-2017-cto-says-2/>

¹³World Economic Forum 2013 Travel and Tourism Competitiveness Report, 2013
http://www3.weforum.org/docs/WEF_TT_Competitiveness_Report_2013.pdf



6 KEY SECTORS PRESENTATION, ANALYSIS, CONCLUSIONS

The presentation does not cover to the same extent all aspects in each of the three regions due to the lack of relevant data (marked as data not available in such cases) and differing levels of DCH penetration.

6.1 CATALONIA/SPAIN

Period	Short description of museums, organisations, and institutions (public / private) in the area	Entrances / visitors Turnover evolution Job positions evolution	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2012-2017	<p>329 archives 497 museums and collections 627 paleontological sites; 12,348 archaeological sites; 35,623 monuments; 2298 declared BCIN (Cultural Asset of National Interest).</p> <p>36,596 cultural companies, of which 842 (2,3%) in Cultural Heritage (2015).</p> <p>Most museums have a very basic level of digitization (<10% of collection); 72% have a website, 76% have Facebook, only 36% have Wi-Fi and 16% use apps.</p>	<p>Archives: 680,390 visitors (2017). Museums and collections: 22.96 million visitors (2017). Decrease during 2013-2015 of globally 15% in museum activities, number of visitors, and number of web visits. Recovery from 2015 to 2017, during which museum activities increase by 36% and visitor numbers increase by 2,5%. The decrease in website visits was compensated by a 25% yearly increase in social media (Facebook, Twitter, Instagram).</p> <p>Cultural Sector: global public investment of 885 M€, of which ~27% corresponds to Cultural Heritage. Lowest investment point in 2013 (-6%). Variability in the behavior of different public funding bodies: county, district and especially town councils try to compensate the decrease in funding by the Catalan Government by augmenting theirs. As of 2016, investments by the Catalan Government have not yet reached the levels of 2013.</p>	<p>Museums lack human resources and suffer from insufficient coordination between administrations. During the economic crisis, museums faced a budget reduction of 5.9% and lost autonomy, which makes internal decision-making more complicated. Additionally, the social dimension is still no a central axis and there is little incorporation of new technologies.</p> <p>The Catalonia Museums 2030 Plan (CMP) is a strategic plan focused on 10-year actions. It already identified the need of museums to enhance autonomy and coordination, to put emphasis on the social dimension, and to incorporate new technologies. Budget has been allocated for this transformation, and especially for the introduction of digital technologies</p>



		<p>Cultural Sector: Gross Added Value 3.7M€ of which 141,751€ (3.72%) correspond to Cultural Heritage (2015). This is the lowest in the sector (advertising and books/press rank the first). Cultural Sector GVA represented in 2015 1.92% of total Catalan economy (2.31% in 2011, lowest point in 2013 with 1,86%). Cultural enterprises amount to 5.91% of the global Catalan economy in 2015 (their weigh has fluctuated during the period). Cultural companies: 365 in 2011; reduced to 118 in 2013. Cultural enterprises turnover: 10.45 M€ annually (2012-2015).</p> <p>Import/export of goods related to Cultural Heritage (2017): 4,926€ / 3,582€. Represents 1,3% and 0,6% of the global import/export in the Cultural Sector. Yearly fluctuation during the period. Citizen global expenditure in 2017: 74,4M€ (10€/person). This doubles the numbers available for 2016 (37,3 M€ and 5€/person).</p> <p>Cultural Sector: employs 147,500 people, of which 6,335 are public servants (2017). During the period, the public sector has lost 968 posts while the private sector was won 3,289. Employees directly related to Cultural Heritage in the private sector: 4,481 (2015).</p>	<p>(e.g. VisitMuseum app), which are seen as a transversal tool to improve cultural products and services. Therefore, digital culture applications could find an immediate field of application and direct funding opportunity. The behavior of social media during the crisis indicates they are a firm value for project development.</p> <p>However, the introduction of Digital Technologies might bring further management difficulties if understaff situation remains unsolved.</p> <p>Cultural enterprises have an important role in terms of economic weight and dynamism, as well as of human capital. Currently, museums resource to the private sector to palliate their shortages. However, the experience both in Catalonia and in other countries (such as the UK) show the shortcomings of this model and the need to reorganize museum staff in order to enhance in-house production.</p>
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Tourism sector			
Period	Short description of Tourism activities and operators (hotels, rooms, operators, etc.)	Evolution of visitors, turnover and job positions evolution	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2011-2017	<p>Tourism in Catalonia is divided in 9 tourism brands. By order of importance: Barcelona, Northern Coast and countryside (Costa Brava), Southern Coast (Costa Daurada), Central Coast (Garraf-Barcelona-Maresme), Pyrenees, Central Countryside (Terres de Lleida), Southern Countryside (Terres de l'Ebre), Central Catalonia, Val d'Aran (Northwestern Pyrenees). Each region offers one or more of the following products: sun and beach, winter sports, nature, rural tourism, culture, adventure, urban tourism, and golf.</p> <p>Change of paradigm the last 10 years. Packages offering Sun & beach or Winter sports have been substituted by tourists demanding quality, diversification, and sustainability. Two main groups of products/offer are on the rise: Cultural Tourism and Nature/adventure/Rural tourism. Low cost companies and the Internet have also changed the market in</p>	<p>2017: total number of tourists is 38.4 million: 37.2% inner tourism, 13.3% from the rest of Spain, and 49.5% foreign tourism. The latter represents 15.7% of the global tourism in Spain and experienced a 5.4% increase with regard to 2016. 80% of visitors come for leisure and 11% for work (2015). Interannual increase fell below 5% in 2012 and 2015.</p> <p>2017: Tourism contributed a 12% of the Catalan GDP, similar to 2016. The number of visitors, turnover, and employment has steadily increased since 2012 (the lowest statistics, due to the global crisis, were registered in 2009 and 2011).</p>	<p>The convergence of Cultural Tourism and the Internet as tool to organize trips provides a clear opportunity for the development of projects aimed at using Digital Technologies as a holistic resource.</p> <p>The creation of new cultural products and services is highly valued by the tourism sector. Digital heritage, as a tourism product, can find in Tourism administrations the path to funding and advising.</p> <p>On the other hand, there is the Strategic Tourism Plan of Catalonia (STPC) 2020. The study states that the combination of natural and cultural resources, together with the use of (mobile) Digital Technologies are key factors for the progress of tourism. Therefore, they are established as a priority and given specific substantial budget. This represents an important opportunity for the</p>



	<p>favour of shorter, more often trips personally booked/organized.</p> <p>The total number of accommodation places in 2017 is 918,000. This represents 22.1% of Spanish and 2.5% of EU offer.</p>		development and management of digital applications in cultural heritage.
Research sector			
Period	Short description of research activities and operators (universities, research centers, funding providers, private sector research)	Evolution of turnover / funding evolution and Job positions	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2011-2017	<p>Three main kinds of R+D institutions: linked to Public Administration, linked to Higher Education, and linked to the Private Sector.</p> <p>R+D units in Catalonia: 231 University Structures; 71 Research Centers; 22 Science and technology parks; 1451 Networks and research groups.</p>	<p>Expenditure (2016): 3,103.4M€, i.e. 1.46% of GDP. From which 19.3% in Public Administration, 22.8% in Higher Education, and 57.8% in the Private Sector. During the period, the numbers decreased until 2014 (by 1.71%). The next two years they fluctuate.</p> <p>Expenditure related to Culture in 2015 amounted to 79,883€. 2013: general increase in human and economic resources devoted to R+D. Decrease (6.3%) takes place in 2014. 14% of Cultural enterprises invest in R+D.</p> <p>3,408 companies (2016). During the period the number decreased until 2014 (by 8.1%). The following two years there was a slight recovery, without reaching the numbers of 2012 (3,951).</p> <p>Funding in Higher Education (2016): 612M€ from public sources, 67.7%M€ from private sources. During</p>	<p>As a result of the crisis, we seem to witness the beginning of a paradigm shift: the weight of research activities and funding are not anymore exclusive of Higher Education and the public administration respectively but move to private companies and foreign funding.</p> <p>This entails more dynamism, bigger budgets, and consequently significant opportunities for the development of big Digital Heritage projects at European level.</p> <p>However, the collaboration between the public and the private sectors needs still to be strengthened; and there is also the risk of projects that disregard basic research and are too much oriented to specific products and immediate benefit.</p>



		<p>the period, public funding decreased until 2014 and fluctuated the next two years. This was compensated by private funding, which increased yearly (with the exception of 2015). In the case of public funding, it comes, by order of importance from: Catalan Government, central government, EU, and local government. While there was a decrease in central government funding until 2014, local and autonomic fluctuated over the years. This was compensated with a bigger resource to foreign funding, which reached its higher lever in 2015.</p> <p>Staff (2016): 46,592.4 full-time hired employees. From which 20.9% in Public Administration, 31.2% in Higher Education, and 47.8% in the Private Sector. During the period the number of personnel decreased until 2014 (by 1.77%). The next two years the numbers fluctuate.</p>	
Entertainment sector			
Period	Short description of activities and operators (thematic parks, attractions, cinemas, theaters)	Evolution of turnover, funding and job positions	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2011-2017	<p>137 movie theatres (2016) 175 theatres (2016) 613 concert theatres (2015)</p> <p>1 leisure park (PortAventura), 8 water parks, 1 amusement park (Tibidabo), 1 miniature park (Catalunya en Miniatura), 1 zoo, 2 unique spaces (Poble Espanyol and Labyrinth Park). The leisure and water parks are located close to main</p>	<p>2016: Constant decrease of movie theatres from 174 in 2012. 19.3 million spectators (lowest number in 2013, -14.58%). Turnover 122.3M€ (lowest number in 2014, -16.69%). 2044 members of permanent staff slight decrease in 2014, -3.2%).</p> <p>2016: Yearly increase of theatres since 2012. 13.977 performances (slight decrease in 2014, -0.5%). 3.2 million spectators (slight decrease in 2013, -5.2%). Turnover 70.7M€ (decrease of 12.6% in 2013).</p>	<p>The growth and diversification of the entertainment sector, especially the leisure activities, pose a serious threat to the Cultural Heritage sector, especially because, unlike the tourism sector, there seems to be no overlapping between them (both in terms of concept and funding). However, the introduction of Digital Technologies as main vehicle for holistic experiences that allow direct</p>



	seaside tourism destinations, while the rest of parks are located around or in the main city of Barcelona.	<p>2015: 9.1M€in funding (lowest number in 2014, -53.1%). 2,401 performances (yearly fluctuation during the period). 7.5 million spectators (worst years were 2013/2014 depending on the type of music). Turnover 67.6M€ (lowest numbers in 2013, -24.9%). 238 members of permanent staff (yearly fluctuation during the period).</p> <p>Port Aventura is the 6th biggest park in the EU and receives ~4 million visitors/year. Net profit in 2017: 16.5M€. Poble Espanyol receives 1.3 million visitors/year. The number of visitors to the zoo has decreased since 2011 and was 1M in 2017. Tibidabo received 670,000 visitors in 2017. All of them have undergone transformations in order to diversify their activities and resources.</p>	participation (e.g. applications for mobile devices, video-mappings, interactive performances) has proven to be effective with audiences. This kind of projects may provide an important path of development, provided the adequate funding calls exist.
Urban development sector			
Period	Short description of activities and operators (investments in infrastructures, real estate evolution)	Evolution of turnover and job positions	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2012-2018	The real estate sector has been the main economic driver in Spain for the last 20 years. Catalonia was not alien to this trend and was also greatly affected by the global economic crisis of the years 2009-2014. In 2017, the trend towards the recovery of the sector continues: 2017 growth represented 4.7% of GDP	<p>Investment in the real estate sector has been growing rapidly. The third quarter of 2017 rose to € 808 million, 38% more than in 2016. The most prominent sectors have been offices, industry and hotels.</p> <p>The real estate sector is the one that has grown the most in Catalonia in 2018, with 12,400 new jobs, i.e. 45.8% more than in 2017. The total number of workers</p>	Barcelona has outgrown the national borders to become a European beacon in terms of real estate and Smart Cities development. The Digital Heritage field can take advantage of this dynamism and interest in terms of funding, provided it can convince both the private and the public sector of the usefulness of the



	<p>compared to 2016. More specifically, construction grew 36.3%, purchase 16.6% and rent a 10 %. In the case of Barcelona, its consolidation as the first most visited city in Spain and the third in Europe, has made the real estate sector in the metropolitan area even more important, and that there are many local businesses and Foreigners engaged in business. Consequently, the purchase and rental prices are on average 7% higher than the rest of the country.</p>	<p>is 154,355, which corresponds to 5.8% of the total working population.</p> <p>On the other hand, Barcelona has long had a reputation for being at the forefront of urban technological innovation. With a municipal network of 500km of optical fibre, free Wi-Fi routed via street lighting, and sensors to monitor air quality, parking spaces, watering of green spaces and even waste bins, Barcelona has been at the cutting edge of testing the internet of things (IoT). For example, during the 2014 Innovation Convention, Barcelona was named the first European Capital of Innovation.</p>	<p>Cultural Heritage from the social, urban, and economic perspective.</p>
Education sector			
Period	Short description of activities and operators (schools primary and secondary, continuous training)	Evolution of turnover And job positions	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2011-2017	<p>Education centres (2017): 5,487 public and 2,743 private.</p> <p>Docents (2017): 75,846 in public centres and 38,063 in private centres.</p> <p>School pupils (2017): 874,999 in public centres, 445,082 in private centres.</p>	<p>2014 saw a slight decrease of 8 registered education centres.</p> <p>The decrease of hired docents started in 2011 and 2012 registered the lowest point (-3.13%).</p> <p>On the contrary, the number of school pupils has been increasing yearly: 2017 representing 4.3% more with regard to the beginning of the period.</p> <p>In 2016, the public investment in education was 4.4B€, which represents 2.6% of the GDP. The private investment amounted to 2.3B€. During the period,</p>	<p>Through the development of permanent educational activities, the Education sector has established a solid link with museums. This guarantees a constant flow of visitors and a further reach to a young audience, who are very keen on using digital technologies. On the other hand, education emerges as a principal objective of museum institutions, as well as a key topic in the different regulations and strategic plans established by the Catalan public administrations. As a result, impact assessment has been</p>



		<p>there was a decrease in public investment. The lowest point was registered in 2014 (-15.9%). 2016 confirmed the consolidation of a recuperation trend, but without reaching the level of 2011.</p> <p>Use of Digital Technologies: Ratio pupils/computer is 3.6 (the lowest in the period). Docents declare having basic and medium knowledge of Digital Technologies. 97.3% of education centres (public and private) have access to the Internet. 98.2% have Wi-Fi that can be used either with the school's equipment (87.7%) or with the pupils' devices (33.5%). Digital Technologies are used, by order of importance, to: navigate and use interactive material from the Web; communicate with pupils; do collaborative work; submit and correct pupils' work; communicate between students; read digital books.</p> <p>During 2017, museums offered 7,799 educational activities. This constitutes a clear recovery, since there was a decrease during 2013-2015. 2015 was the lowest point with -17.3%.</p>	<p>developed further than in any other field and it has confirmed the positive role of digital technologies in the interpretation of cultural heritage and the establishment of collaborations at different levels of the academic sector.</p> <p>This appears as one of the more promising avenues for the development of Digital Heritage projects.</p>
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The sources of the data consist of data and studies from public bodies¹⁴

¹⁴ <http://dadesculturals.gencat.cat/en/inici/>

http://dadesculturals.gencat.cat/web/.content/sscc/gt/arxius_gt/Estadistiques-culturals-de-Catalunya-2018.pdf

http://cultura.gencat.cat/web/.content/sscc/gt/arxius_gt/DADES_ACTIVITAT_2017_v1.pdf

<https://www.idescat.cat/pub/?id=aec>

http://empresa.gencat.cat/web/.content/20_turisme/coneixement_i_planificacio/estadistiques/catalunya_turistica_en_xifres/documents/arxius/ctx_2015.pdf

http://economia.gencat.cat/ca/70_ambits_actuacio/economia_catalana/trets/003-estructura-productiva/035-turisme/



6.2 GREECE – CENTRAL MACEDONIA – THESSALONIKI

Cultural Heritage sector			
Period	Short description of museums, organisations, and institutions (public private) in the area	Visitors evolution Turnover evolution Job positions evolution	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2008-2018	Over the past decade (2008 – 2018) The cultural heritage in the region of Thessaloniki has been greatly advanced. Within the city, more museums and cultural centers (Industrial Museum, Galerius Complex etc.) are installing Digital expeditions using modern AR/VR technologies and visualizations. Thessaloniki is the cultural capital of northern Greece. The city is home to many museums each one presenting a different era of its history. Upon them, the Archeological Museum of Thessaloniki, the Museum of Byzantine Culture, the Folk and Ethnological Museum and the Cultural Center of Thessaloniki.	The Cultural Heritage sector in Thessaloniki provides an excellent area of interest for museum curators, archeologists and cultural heritage experts. The city is actively involved in EU programs for Cultural Heritage leading to the development of Cultural Heritage activities.	The Cultural Heritage sector in the region of Thessaloniki provides useful information and opportunities for the development of Digital Cultural Heritage applications. This information includes (but is not limited to) the history of the monuments/museums, the design of these monuments/museums and the living conditions of the people who used to live in the past, in order to be incorporated to the Digital Cultural Heritage applications in the most accurate way possible. Some limitations may include the difficulty to simulate every smallest detail of the history that is provided, but with the help of the most recent technologies, these limitations are disappearing day by day.

http://universitatsirecerca.gencat.cat/ca/02_serveis_i_tramits/estudis_i_estadistiques/estadistiques_d_universitats/

<http://www.bcn.cat/estadistica/catala/dades/ttreball/afiliats/inss/trebsec/sc1t.htm>

<http://ensenyament.gencat.cat/ca/departament/estadistiques/>



Tourism sector			
Period	Short description of Tourism activities and operators (hotels, rooms, operators, etc.)	Visitors evolution Turnover evolution Job positions evolution	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2010-2018	<p>The tourism in the region of Thessaloniki and in Northern Macedonia is growing due to the provided infrastructures and facilities. Specifically, the region of Chalkidiki is considered one of the most popular summer tourist destinations in Greece.</p> <p>The tourism in Thessaloniki has been greatly evolved in recent decades. The city offers a lot of tourism activities, combining both entertainment and educational aspects.</p>	<p>The tourism industry in the region of Thessaloniki offers job positions and opportunities for tourism workers. The city has been adapted to provide all the necessary facilities to tourists.</p>	<p>The Tourism sector in the region of Thessaloniki is directly connected to Digital Cultural Heritage development. The creation of Digital Cultural Heritage applications enhances the museum experience of the visitors, making it more interesting and fun. This leads to the increase of the tourism in the specific area in which museums with Digital Cultural Heritage content are located, which enhances the economy of that area as well. The more interesting the Digital Cultural Heritage content offered to the people is, the more people will be attracted which greatly impacts tourism. That is why Digital Cultural Heritage application should provide the users with a large variety of choices and interactions and should not be limited to plain storytelling, for instance.</p>
Research sector			
Period	Short description of research activities and operators (universities, research centers, funding providers, private sector research)	Visitors evolution Turnover / funding evolution Job positions evolution	Conclusion for interactions, opportunities and limitations concerning digital heritage development
	<p>Over the past decade, the research on Cultural heritage in the region of Thessaloniki has published important articles on various thematic areas. The Aristotle University of Thessaloniki (which consists of 12 Faculties, 42</p>	<p>The research sector in the city of Thessaloniki has grown due to the involvement of students and researchers to academic projects. There is a lot of interest and</p>	<p>The Research sector in the region of Thessaloniki is evolving every day. New technologies emerge continuously, which can be used for digital heritage development. This is very helpful for the development of Digital</p>



	Schools and 289 Laboratories) conducts research projects, participates in European research programs and projects. The Aristotle University of Thessaloniki and the University of Macedonia are two of the most well-known universities in Greece. Both offering great research outcomes in technological and humanistic sciences.	investments for research projects offering job opportunities for students in the academic environment.	Cultural Heritage applications, as new technologies and interactions can be used to make the digital content appear more realistic to the people and also offer new interactions, which will enhance the interest of the people. For instance, new global illumination algorithms are being researched to be used in a digital heritage application to make the characters and buildings to be rendered more realistically. The more realistic a Digital Cultural Heritage application is, the more people it will attract, enhancing tourism and the economy of a specific area as well.
Entertainment sector			
Period	Short description of entertainment activities and operators (thematic parks, attractions, cinemas, theaters)	Visitors evolution Turnover / funding evolution Job positions evolution	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2008-2018	Over the last decade, due to the large student population in the region of Thessaloniki, more activities and facilities around the entertainment sector are developed. The city was also the European Youth Capital in 2014. Thessaloniki is not only regarded as the cultural and entertainment capital of northern Greece but also the cultural capital of the country. The city has long been known in Greece for its vibrant city culture, including theaters (National Theatre of Northern Greece) the Thessaloniki Concert Hall and symphonic orchestras. Thessaloniki is also	To support this highly demanding and growing entertainment industry, Thessaloniki offers opportunities and job positions in this sector. The rapid growth of the entertainment industry in the region of Thessaloniki is also due to its large young population and multicultural feel.	The Entertainment sector is very important for the region of Thessaloniki. This sector should also be incorporated into digital heritage development. In order for people to successfully learn information about the history of a museum/monument through a Digital Cultural Heritage application, some entertainment elements should also be included. Such elements could be some mini-games, which a Digital Cultural Heritage application could include to make it more fun for the users. These mini-games should have an educative format, so that the people will learn new things through



	renowned for its major shopping streets and lively laneways		them. As a result, entertainment elements are essential for digital heritage development.
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Urban development sector			
Period	Short description of entertainment activities and operators (investments in infrastructures, real estate evolution)	Visitors evolution Turnover / funding evolution Job positions evolution	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2010-2017	During the period of economic crisis (2010-2017) at the region of Thessaloniki, new business ideas are cropping up and new hopes blooming despite the economic circumstances. Thessaloniki is the second biggest city of Greece and its geographic location being the key element to its rapid urban development. The city was founded over 2.300 ago and since 1912, its population and facilities are steady growing. With three large universities, industrial and manufacture areas, refinery settlements, a harbor, a railway station, an airport and a population of over 1,500,000, Thessaloniki presents a linear coastal front of over 50 km.	No data available.	Efforts are made daily to improve the Urban sector for the region of Thessaloniki. The latest infrastructure that is under development, which is the metro, will provide easy and fast access to many parts of the city. That will enhance the tourists' transportation to museums/monuments where Digital Cultural Heritage applications are used, resulting in even more people using these applications and making the Digital Cultural Heritage sector even more popular among the region of Thessaloniki.



Education sector			
Period	Short description of education activities and operators (schools primary and secondary, continuous training)	Visitors evolution Turnover / funding evolution Job positions evolution	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2006-2018	<p>Over the past decade, the educational sector on the region of Thessaloniki has been evolved rapidly due to the large number of students in the city. The university complex not only supports academic researchers and educational faculty but also ambitious projects from students and ideas grown from the challenging educational environment. Thessaloniki is a major center of education for <u>Greece</u>. Three of the country's largest universities are located in central Thessaloniki: <u>Aristotle University of Thessaloniki</u>, the <u>University of Macedonia</u> and the <u>International Hellenic University</u>. Numerous public and private <u>vocational institutes</u> provide professional training to young students, while a large number of private colleges offer <u>American</u> and <u>UK</u> academic curriculum, via cooperation with foreign universities.</p>	<p>As of 2006 the city's total student population was estimated around 200,000. This high demand on educational faculty resulted to the growth of educational facilities in Thessaloniki offering more positions for teachers and academics.</p>	<p>The Education sector can be connected directly to the Digital Cultural Heritage sector. The digital heritage content is not only meant for informing tourists about the history of a monument. It can also be used for education purposes. For instance, school visits could take place to museums/monuments, which offer digital heritage content in order for the students to be informed about the history of the museum/monument through a fun way, by using a Digital Cultural Heritage application. That way, the students (and especially kids) will learn a lot more things about the history of the museum/monument compared to the traditional storytelling. As a result, there are many opportunities for the development of Digital Cultural Heritage applications that can contribute to the Education sector.</p>



6.3 CYPRUS

Cultural Heritage sector			
Period	Short description of museums, organisations, and institutions (public private) in the area	Visitors evolution Turnover evolution Job positions evolution	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2010-2017	<p>Cyprus boasts well over a thousand Listed Monuments. The island is an open-air museum of prehistoric settlements, classical Greek temples, Roman theatres and villas, Early Christian basilicas, Byzantine churches and monasteries, Crusader castles, Gothic cathedrals, Venetian fortifications, Moslem mosques, and British colonial-style buildings.</p> <p>All of the major cities of Cyprus have museums housing material from the wider district that they serve. There are also a number of smaller museums which service specific sites. Apart from the larger sites which may have their own museum. visiting the district museums is the main way to sample the material culture of Cypriot archaeology.</p> <p>Painted churches of the Troodos region. Characterized by one of the largest groups of churches and monasteries of the former Byzantine Empire. The complex of 10 monuments included on the World Heritage</p>	Data not available	<p>There has been considerable destruction and deterioration of monuments, principally in the North of the island, since it was divided in 1974.</p> <p>CUT and its international partners have conducted work to digitise, create 3D models and document holistically the church at Asinou and the Monastery at St Neophytos, in part under the Marie Curie ITN-DCH research training programme 2014-17, which has created a basis for the innovative exploitation of DCH in Cyprus.</p> <p>The Smart Specialisation Strategy for Cyprus, launched in 2015 as a conditionality during the programming period 2014-2020, for the exploitation of resources from the European Structural and Investment Funds for enhancing Research and Innovation (R & I) in areas where each country has a competitive advantage, identified its priority areas as: Energy, Tourism, the Structured Environment/Construction Industry, Transport/Marine, Agriculture/Food Industry and</p>



	<p>List in 1985, all richly decorated with murals, provides an overview of Byzantine and post-Byzantine painting in Cyprus.</p> <p>Paphos, inscribed on the World Heritage List in 1980, has been inhabited since the Neolithic period. It was a centre of the cult of Aphrodite and of pre-Hellenic fertility deities. The remains of villas, palaces, theatres, fortresses and tombs mean that the site is of exceptional architectural and historic value. The mosaics of NeaPaphos are among the most beautiful in the world. Paphos was European Capital of Culture 2017.</p> <p>Choirokoitia</p> <p>The Neolithic settlement is one of the most important prehistoric sites in the eastern Mediterranean, inscribed on the World Heritage List in 1998. Since only part of the site has been excavated, it forms an exceptional archaeological reserve for future study.</p> <p>.In the second half of 2017, the government has established a new committee to develop strategies for DCH.</p> <p>Cyprus University of Technology (Digital Heritage Research Laboratory) was appointed UNESCO Chair of Digital Heritage in late 2017,</p>		<p>the sector of Health. Cultural Heritage has a key role to play in several of these areas.</p> <p>The results of the DCH study commissioned by the new Committee should demonstrate state priorities for digitization of the cultural heritage (e.g. religious tourism or other areas with added value to the country's economy). The analysis should have three levels of response: Now (by 2020), in the medium term (2025) and in the longer term (2030).</p> <p>Points to be included:</p> <ul style="list-style-type: none"> • Use of ICT to promote cultural heritage • Electronic / Digital Tourism Virtual Cultural Heritage • Linking monuments to local society and history • Linking with Destination Management • Developing relevant skills • Sustainability and enrichment of data and applications • New business models • Need to create a digital platform for the Cypriot digital cultural heritage and / or the creation of virtual museums; • Proper investment of available European Structural Funds for long-term preservation • Need for training and retraining of staff and generally human resources. • Exploitation of European funds for education and retraining of young unemployed.
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	providing significant potential for influencing the status of and investment in DCH in the years to come.		<ul style="list-style-type: none"> Regional cooperation with neighbouring countries.
Tourism sector			
Period	Short description of Tourism activities and operators (hotels, rooms, operators, etc.)	Evolution of visitors, turnover and job positions	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2010-2017	Much of the tourist industry relies on "sea sun and sand" to attract tourists. This reflects in the seasonal distribution of tourist arrivals with a disproportionate number arriving during the summer months. Whereas most eastern resorts like Protaras and Ayia Napa lie dormant in the winter months the west of the island remains open to tourism with the promotion of Cypriot history culture, art and specialized sports such as golf and tennis.	<p>The total number of tourists in Cyprus in 2017 was 3,652,073 and in 2018 3,921,082.</p> <p>The contribution of travel and tourism to GDP was 21.4 %, in 2017 up from 19.4 % previous year.</p> <p>The World Travel and Tourism Council 2016 report on the island outlines that the total investment in the Travel & Tourism industry in 2015 was EUR273.7mn, or 14.0% of the total investments. It projects a rise by 5.3% in 2016 and 2.9% pa over the next ten years to EUR384.6mn in 2026</p>	A more proactive and sustainable approach towards the provision of digital applications can stimulate interest in and improve experiences of cultural tourism.



Research sector			
Period	Short description of research activities and operators (universities, research centers, funding providers, private sector research)	Evolution of turnover, funding evolution and Job positions	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2010-2017	<p>Proposal for MEDSTACH Teaming Project under the Horizon 2020 Widening Programme ranked of all proposals received from eligible countries in Phase 1 of the 2017 call. Aims to establish Cyprus as an excellence hub in archaeology and cultural heritage in the Eastern Mediterranean region, capitalising on multidisciplinary research and technological innovation. The mission is the development of the necessary scientific and technological environment for the advancement of the state-of-the-art in archaeology and cultural heritage research.</p> <p>The RISE (Research centre on Interactive media, Smart systems and Emerging technologies) established in 2016 with Horizon 2020 funding. It aims to become a Centre of Excellence and a hub across the three continents bordering Cyprus, facilitating thus the local scientific, technological, and economic growth of the region. It identifies the potential of Interactive Media to bring together several scientific areas, yielding applications in the priority areas of the Smart Specialisation Strategy of Cyprus. Therefore, research in RISE integrates the Visual Sciences, Human Factors and Design, and</p>	<p>The Centre's mission is fully aligned with the Smart Specialisation Strategy for Cyprus, promoting in a sustainable way smart specialisation and new job creation</p>	<p>Should MEDSTACH succeed with its Phase 2 proposal a considerable resource will be released for research and innovation in Cultural Heritage in support of economic and social development in Cyprus and the Middle East, with CH as a core strand.</p> <p>The Mnemosyne ERA Chair in DCH provides an opportunity to develop a strong capacity in holistic approaches towards the digital developments of CH.</p>



	<p>Communications and Artificial Intelligence, in a tight synergy that provides a unique interdisciplinary research perspective that emphasizes an “Inspired by Humans, Designed for Humans” philosophy. Cultural heritage is included in its ambit.</p> <p>The ‘Mnemosyne’ European Research Area Chair in Digital Cultural Heritage was awarded to DHRLab at Cyprus University of Technology under Horizon 2020 for a 5-year period beginning January 2019.</p>		
Entertainment sector			
Period	Short description of activities and operators (thematic parks, attractions, cinemas, theaters)	Evolution of turnover, funding and job positions	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2010-2017	There are several water parks in Cyprus other theme parks and a zoo.	Not available	An interactive GIS map of the parks, combined with bicycle paths and routes is in development for smart devices, integrated with Google Maps.
Urban development sector			
Period	Short description of activities and operators (investments in infrastructures, real estate evolution)	Evolution of turnover and job positions	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2010-2017	The confidence level that is currently exhibited across the Cyprus real estate market largely reflects the positive developments in the economy of the country as well as the improvement of economic performance	The value of new building permits issued in 2017 increased by 49% on an annual basis across Cyprus. 24% increase in sale contracts across Cyprus	Uncertain – a potential threat to some archaeological sites



	<p>indicators, since the low point of the economic crash in 2013.</p> <p>Interest from foreign buyers, which has been a driving force for the market, has increased significantly. Growth in all property price indices was recorded during 2017, reflecting the increased demand and activity levels in the real estate sector.</p> <p>Nicosia is the district with the highest concentration of new development licensed area (35% of total) Limassol attracts c.52% of transactions in the high-end residential property segment.</p>	<p>Majority of transactions were recorded in Limassol (36% of total)</p> <p>Famagusta recorded the highest annual growth in number of sale contracts during 2017 (44%), followed by Nicosia (42%)</p>	
Education sector			
Period	Short description of activities and operators (schools primary and secondary, continuous training)	Evolution of turnover And job positions	Conclusion for interactions, opportunities and limitations concerning digital heritage development
2010-2017	Visit-based education programmes are offered to primary school students at several museums in Nicosia, Limassol, Larnaka and Paphos	Not available	A concerted effort is required towards continuous training of cultural heritage professionals, curriculum and syllabus development at all levels of education.

7 THE MICRO LEVEL

ERROR! BOOKMARK NOT DEFINED. The micro level approach is a bottom-up analysis, as explained in the methodology section above. It intends to identify in D6.1. some specific cases demonstrating the penetration of DHC in the 3 regions in order to illustrate the big picture of the related sectors and economy of the region. It also aims to provide an initial mapping of cases to be analysed, following the existing data in order to illustrate the objectives of D.6.2. concerning interrelations, detailed legal framework and objectives, challenges and obstacles in each of the regions of the various stakeholders.

7.1 CATALONIA / SPAIN

In close collaboration and with the support of the regional administration and the experts, the following cases have been initially selected in order to be explored within the next phase of the project to extract conclusions on the effectiveness of the regional policies and objectives for digital museums and digital heritage development.

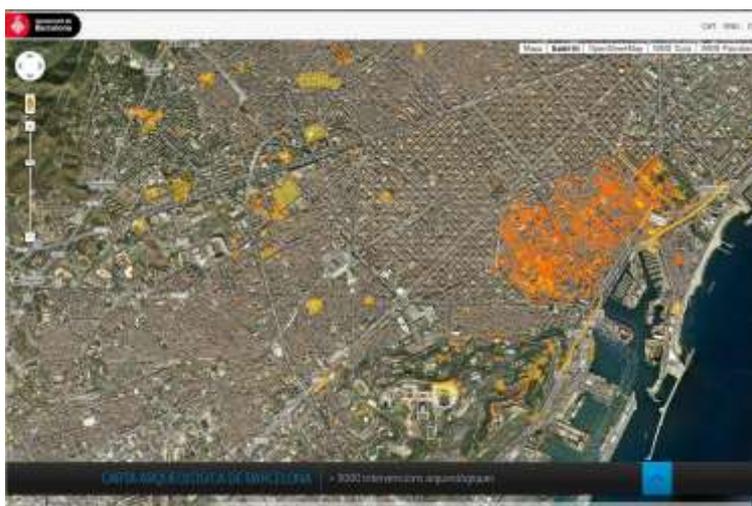
The criteria taken into account to this initial selection of exemplification of cases include: the variety of their typology (framework digital projects for museums promotion, virtual museums on-line, mobile technologies etc); the availability of data; the relationship with local development; branding; and more specifically tourism and growth objectives besides cultural asset preservation and development. Attention has been paid to the coverage of different territorial and economic environments and the repartition among urban and rural environments in order to better understand the operational mode of the institutional framework of the digital museum projects, the relationship, sustainability and business planning and impact. The cases also provide a diversified cultural asset provenance (archaeological sites, built environment, cultural/natural environment, tangible and intangible information).

Various aspects of the relationship between policies on digital culture enhancement and support at the macro level (local, regional, national, European) and its effectiveness as far as cost benefit, growth, obstacles and needs go, will be explored and questioned based on information that will be extracted from the micro case studies, including:

- Budget/funding/process of implementation and development / regional policies objectives vs project stakeholders' objectives/ links of project with regional policies and resources / impact on growth, job creation in the project itself or tourist sector enhancement and sectors.
- Mapping of the links of the project with the economical institutional framework around the project
- Technical financial economic obstacles and opportunities, standardization and legal framework, job creation potential, conciliation of possibly deviating objectives or perspectives of stakeholders and policy makers.

It is not expected that all aspects will be equally important or analysed in all cases, due to the specific conditions and framework of each case, the data available, the different stakeholders and objectives. However, the analysis is expected to provide the possibility to build a highly complementary image of the complex relationships between: a) digital heritage policies and stakeholders b) digital museums and projects design and creation / and c) Impact on various economic sectors, tourism and others. This image will allow comparison with the overall growth objectives of the institutional players (such as the plan for the museums development and the culture valorisation of the government, the regional development objectives, and the European objectives and priorities)

Case 1 - CARTA ARQUEOLÒGICA DE BARCELONA



The overall project and its cultural assets

The Barcelona Archaeological Chart is an inventory of interventions and places of archaeological interest in the city. It is based on the idea that Barcelona is a unique site with several points of archaeological interest. It includes: all actions carried out by the Archaeological Service (preventive and planned excavations, surface and subsoil surveys); any sporadic finds and news about possible actions where archeological material or historical structures have been located. It should be noted that information cards have also been produced from various historical studies regarding specific buildings and Civil War bomb shelters (what is known as archaeology of architecture and non-invasive surveys of the built heritage).

The Chart is available online, with all the information structured by the location map. There are more than 3,000 points, distributed in archaeological interventions, urban centers, farmhouses, and refuges of the Civil War. Various types of searches can be performed by street, by finds or sites and also by chronologies. The web publishing environment is an Internet Information Server programmed in .NET and supported by a SQL Server database. The digital cartography used is Google Maps, with optional load of WMS services from the City Council of Barcelona (plot and urban guide) and open maps.

Project concept

The online Barcelona Archaeological Chart is repository of the historical past of the city. It aims to offer a set of structured information where all the documentation of the archaeological heritage of Barcelona from Prehistory to Spanish Civil War is collected. This constitutes a tool for analysis, diagnosis, and assessment of the subsoil and the built heritage of Barcelona.

History

Within the framework of the Barcelona Growth economic development initiative, the BCN | Open Challenge is a program that promotes innovative solutions to six different challenges that aim to transform public space and improve the city's services. Since 2014, the Barcelona Culture Institute participates actively in the digitization of 326,000 items (including pages of books, documents, and glass plates) of different historical and photographic archives and municipal museums. The process started in 2015 and continued throughout 2016 and 2017, with the open dissemination of digitized collections on the Internet, and the creation of ad hoc projects for the valuation of the aforementioned funds.

With a total budget of € 369,050 for the period 2015-2017, the project groups 10 entities and is structured in four major phases that cover 1) the identification and preparation of collections; 2) their digitization; 3) the creation of consultation, dissemination, and preservation repositories; and finally, 4) the creation of ad hoc

projects for the retrieval and dissemination of singular items that require additional dissemination. This is the case of the Archaeological Charter of Barcelona (presented in 2012) and of Barcino 3D (presented in 2014, see below).

Stakeholders/owners

The project belongs to the Heritage, Museums and Archives Directorate of the Barcelona Culture Institute, coordinated by the Archaeology Service Documentation area. The online version of the archaeological chart has been made jointly with the Department of Information Systems of the Barcelona Culture Institute.

- **Execution and coordination:** Barcelona Archaeological Service (Carme Miró).
- **Technological development:** Marta Fàbregas (Attics) / David Solà (Edittio)

Impact

The project foresees among others the following impact indicators:

- Number and nature of queries to the Chart.
- Number of interventions
- Public visibility and other archaeological communication projects.

Links

<http://cartaarqueologica.bcn.cat>

Bibliography

All the information has been kindly provided by Marc Hernández, formerly Chief Information Officer at the Barcelona Culture Institute.

Case 2: BARCINO 3D



The overall project and its cultural assets

Barcino 3D is a multi-platform application showing the virtual restoration of the Roman city of Barcelona and the territory that surrounded it during the 3rd century AD. In addition to the virtual model of the city and the territory, the project has been completed with different sections that help understand and interpret Barcino's context: its history, a glossary with Latin terms and relevant names, archaeological itineraries, and a photographic gallery with archaeological material. The project also allows establishment of the correspondences between the Roman city and today, since all the information it contains is georeferenced. It is available in three languages (Catalan, Spanish and English), and is aimed at different types of audiences, such as specialists, tourists and families.



Project concept

This project aims to provide a powerful technological tool that allows users to explore in an interesting and entertaining way the Roman remains of Barcelona.

History/process

Barcino 3D is one of the several outputs foreseen as part of SmartBarcino, a transversal project that seeks to apply the full potential of new technologies to the dissemination and documentation of heritage, making it available to everyone. Other applications that have been developed are the Archaeological Chart (see above), and the Archaeology Service website, which has been operational since February 2014, and allows users to take a tour of Barcelona's archaeological remains, and to retrieve publications and newspapers.

The recreated model is based on the scientific work carried out by an extensive group of archaeologists, historians, epigraphers, etc. over a hundred years. The starting point has been the documentation generated as a result of archaeological excavations and heritage studies preserved in the Documentation Center of the Archeology Service of Barcelona, and the various research projects related to Roman Barcelona that have been published in different places. This virtual restitution of the city, the landscape, and the coastline of the 3rd century AD has been superimposed on a 15m-resolution digital terrain model (MDT) created by the Cartographic and Geological Institute of Catalonia (ICGC). Geo-referenced information has been maintained at all times so that historical architectural elements and the remaining remains can be superimposed on the model. Interactive panoramic images allow illustrating and emphasizing this correspondence.

Stakeholders/owners

The participating organizations are the Barcelona Archaeology Service, the Department of Information Systems of the Barcelona Culture Institute, and the Polytechnic University of Catalonia (UPC).

- **Execution and coordination:** Barcelona Archaeology Service.
- **Technological development:** J. L. Domingo (graphic design) and LMVC-UPC (modelling and programming).

Impact

The project foresees the following impact indicators:

- Number of downloads.
- Logging of general use.
- Use as pedagogical resource.
- Linking with educational projects.
- Public visibility and in other communication projects.

Links

<http://arqueologiabarcelona.bcn.cat/pla-barcino/barcino3D/>

<http://ajuntament.barcelona.cat/arqueologiabarcelona/pla-barcino/barcino3d/>

Bibliography

All information kindly provided by Marc Hernandez, formerly Chief Information Officer at the Barcelona Culture Institute.

Case 3 - APROPA-CULTURA



The overall project and its cultural assets

Apropa-Cultura is an initiative of inclusive cultural leisure for social entities. The program was created in 2006 with the aim of improving the lives of vulnerable people and promoting access to culture and inclusive leisure. In order to eliminate invisible cultural barriers, Apropa-Cultura has woven a network of cultural programmers, institutions and patrons to make culture accessible to everyone.

At present, around 1,800 social entities and services in Catalonia are registered in the program, thanks to which they can enjoy the cultural offer of the more than 90 cultural facilities - concert halls, audiences, singular spaces, festivals and museums - that offer their regular programming through the Apropa-Cultura platform (www.apropacultura.cat) by offering part of its locations and activities at a reduced price (0-3€).

The museums and singular spaces attached to the program in Barcelona are: the National Museum of Art of Catalonia (MNAC), the Museum of Contemporary Art of Barcelona (MACBA), CaixaForum Barcelona, the Picasso Museum, the Joan Miró Foundation, the Center of Contemporary Culture of Barcelona (CCCB), Cosmocaixa, El Born Culture and Memory Center, the Museum of Music, the History Museum of Barcelona, the Museum of World Cultures, the Ethnological Museum, the Museum of Design, the Marès Museum, the Pedralbes Monastery, the Montjuïc Castle, and the Park Güell.

Project concept and objectives

The project aims to offer a collaborative online platform that facilitates the synergy between cultural facilities and social entities. By enhancing the accessibility of users and professionals of social entities to the programming of cultural facilities, it promotes inclusion and social transformation.

History

Apropa-Cultura started in 2006 at the Barcelona Concert Hall (L'Auditori), under the name "L'AuditoriApropa", to respond to the demand of certain social groups to attend concerts programmed by the Educational Service of L'Auditori. It had the support of the Departments of Welfare and Family of the Generalitat de Catalunya and of the City Council of Barcelona. These requests turned out to be the tip of the iceberg of a real and growing social demand. The success of the program gave birth in 2010 to Apropa-Cultura. In this case, the participating organizations were L'Auditori, the National Theater of Catalonia, the Mercat de les Flors, and the TeatreLliure; and it had the support of the Diputació de Barcelona. As of 2012, territorial expansion began and new facilities around Catalonia adhered to the network. One year later, thanks to the support of "la Caixa" Welfare Projects, museums started to be integrated. The Barcelona

Culture Institute adhered to the network in 2013 by incorporating the Grec Festival of Barcelona and, in the following years, several museums under its management. In December 2017, Apropa-Cultura consists of more than 90 theatres, auditoriums, festivals and museums in 24 municipalities.

Stakeholders/owners.

The ownership of the cultural assets belongs to each institution involved.

- **Execution and coordination:** Apropa-Cultura is a joint endeavor of the diverse cultural facilities in the network. The coordination is carried out from L'Auditori, which provides the general services that allow the economic viability of the program, with the collaboration of the people in charge of each equipment.
- **Technological development:** The platform has been designed by the Apropa-Cultura team while its programming has been carried out by the company PUKKAS-Internet Solutions.
- **Budget / funding:** Apropa Cultura has the financial support of the Generalitat de Catalunya, the Barcelona City Council, the Diputació de Barcelona, "la Caixa" Social Outreach, the Transversal Consortium Network of Cultural Activities, and the MRW Foundation.
- **Duration of development:** Apropa-Cultura is an ongoing project, but the core development was carried out between 2006 and 2010.

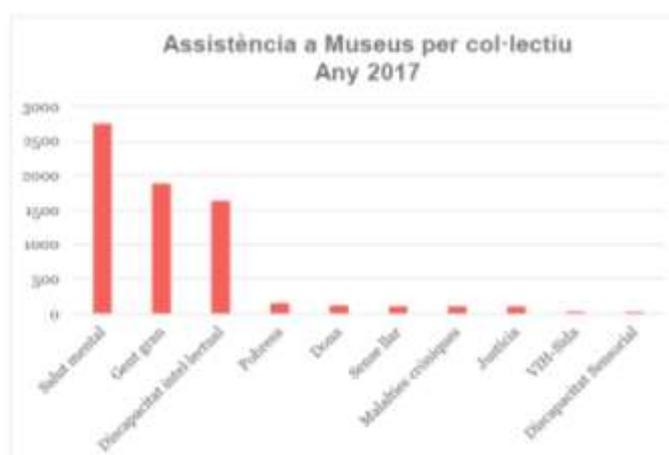
Impact

During 2017, 9,657 people have visited museums thanks to the activities proposed by social entities using Apropa-Cultura. As preliminary quantitative data, the table and chart below show the number of visits by museum and by type of potential social vulnerability.

Equipaments museístics, ordenat per tipus de visita

De més a menys assistència

	Visita comentada	Visita lliure	Visita + taller	Visita dinamitzada	Projecció	TOTAL
Basilica de la Sagrada Família	1519					1519
CaixaForum Barcelona	797					797
CaixaForum Tarragona	10					10
Castell de Montjuïc	202		28			230
Centre de Cultura Contemporània de Barcelona	140	545				685
Cosmocaixa	208	574		279	566	1627
El Born Centre de Cultura i Memòria	275		197	114		586
Fundació Joan Miró	185	329	152			666
MACBA	58	183		52		293
Museu de la Música	80	168	435	74		757
Museu Nacional d'Art de Catalunya	449	515	154			1118
Museu Picasso	37	167	321	313		838
Park Güell		168				168
Palau de la Música	137					137
Gran Teatre del Liceu	123					123
Zoo de Barcelona	42	61				103
Total general	4262	2710	1287	832	566	9657



Links

www.apropacultura.cat

Bibliography

All the information has been kindly provided by Marc Hernández, formerly Chief Information Officer at the Barcelona Culture Institute.

CASE 4 - IMMERSIVE INSTALLATION: ULLASTRET 3D



Picture taken from Patrimoni Cultural, Generalitat de Catalunya web page.

The overall project and the cultural assets

The Iberian town of Ullastret (6-2 B.C.) is located on today's Empordà plain in Catalonia, Spain, and is one of the most well-known and outstanding Girona archaeological sites of the north-west Mediterranean, built 20 km. south of Ampurias. This large urban settlement was formed by two inhabited centers, one being the Puig de Sant Andreu (Saint Andrew Hill) and the other the Illa d'enReixac (Reixac Island), separated, one from the other by a distance of only 300 meters.

Between them, the two settlements eventually extended over a wall an area exceeding 15 hectares and they constituted the capital of the Iberian tribe known as the Indiketes. This Iberian town lived a great splendor between the 4th and 3rd centuries BC, with a population over 6,000 inhabitants, was one of the biggest concentrations in the pre-Roman Iberian Peninsula. The site was discovered around 1930 but it is the research that has been carried out over recent years, based in many cases on the application of the latest generation of geophysical prospection techniques that has produced the greatest knowledge with regard to its urban and defensive structures and the surrounding area.

This resulted in the development of a project for the virtual 3D reconstruction of the entire settlement based on scientific knowledge which, in turn, has benefitted from the important advances made in the study of Iberian culture over recent years. Because it is the best-known period from a scientific point of view, construction focuses on a specific moment in the settlement's history, around the year 250 B.C. The 3D virtual Project was under the direction of the Ullastret branch of the Archaeological Museum of Catalonia, as



it promotes the Iberian culture in the northeastern area of Catalonia through the excavations carried out in the sites that make up the archaeological site of Ullastret.

Project concept

The Immersive installation "Ullastret 3D", is a virtual reconstruction of the archaeological site of the Iberian town of Ullastret, considered the most important settlement of its kind in Catalonia. The virtual reconstruction developed a storytelling experience based on a 3D model and displayed by two different applications: an immersive room at Ullastret Museum, and a virtual reality headset. The new technologies together with virtual reality used in Ullastret 3D transports users 2000 years back in history, allowing them to explore the city of Ullastret¹⁵.

The projection lasts 6 minutes and is available in Catalan, Spanish, French, English and German. These audiovisual experiences have been conceived as an important tool for the promotion and interpretation of cultural heritage, making learning through digital applications a fun, innovative and interactive experience.

Process

The project was directed by the Ullastret branch of the Museum of Archeology of Catalonia who formed a multidisciplinary team composed of architects, hydrologists, anthropologists and naval architects, an integration of different disciplines with the firm intention of achieving a precise and detailed reproduction of the Iberian town. Within the team was the Catalan Agency for Cultural Heritage who was the coordinator at a technical level and which together with the company Burzon Comence developed the content in 3D.

The first step to reach the reconstruction consisted of gathering as much archaeological information as possible about the site, to be later analyzed and validated by experts in the field. Special attention was given to obtain accurate information regarding the geographical characteristics and vegetation of the area. Once the information was approved, it was passed to the design team responsible for 3D development.

The next step was to analyze the characteristics of the settlement, considering walls, roads, buildings and other constructions of the time. Thereafter, different items were included inside the buildings among which are representative objects of the Iberian culture and which were found in excavations in the area such as tools, jars, swords, shields, etc., and are currently part of the Ullastret Museum's collection.

The model was constructed using 3D maps provided by the Institute of Cartography and Geology of Catalonia. The software used to develop the immersive experience allowed to create scenarios with great definition and details of the landscapes, buildings, roads, vegetation and objects.

After a year and a half of work, the first stage of the project culminated with the result of a video of the reconstruction of the town. Subsequently and considering economic and technical factors, a decision was taken to develop two applications: an immersive room in which to project an audiovisual of the virtual reconstruction (Ullastret Museum), and an adaptation of the virtual reconstruction to be experienced through virtual reality headsets (Archaeological Museum of Catalonia).

Stakeholders/owner

Public / private

The Ullastret branch of the Archaeological Museum, in coordination with Patrimoni en Acció (Heritage in Action) programme, which promotes the social use and knowledge of Catalan cultural heritage under the auspices of the Department of Culture and the private Obra Social "La Caixa".

¹⁵<http://patrimoni.gencat.cat/es/historias/ullastret-3d-caminar-por-una-ciudad-iberica-de-hace-2000-anos>

Case 5 - CULTURAL HERITAGE OF MON SANT BENET



The overall project and the cultural assets

Sant Benet de Bages Monastery, located on Sant Fruitós de Bages, was built in 960 with a Romanesque architecture, and is one of the best preserved medieval monastic sites in Catalunya as one of the most emblematic monuments in the region. Over the centuries, the monastery has gone through striking events that marked its activities as well as its architecture: The plague in 1348, wars and conflicts, fires and a lack of maintenances sent Sant Benet into decline from the 15th century onwards.

The monastery was active until 1835. Afterwards, workers in a textile industry used the properties as homes. It was until 1909 that the place was acquired by the family of the painter Ramón Casas who hired architect Josep Puig i Cadafalch to work on the restoration of the buildings, giving Mon Sant Benet a new opportunity to emerge. Due to its rich history and cultural heritage, Mon Sant Benet de Bages was recognized as a national monument in 1931.

In 2000 the property was purchased by Caixa Manresa (now Catalunya Caixa, a private Bank) with the aim of developing a visionary, multi- functional project that gathers cultural heritage, tourism and pedagogical activities. The Mon Sant Benet center was inaugurated on November 12, 2007.

Project concept

Món Sant Benet is a cultural heritage center with medieval roots that integrates cultural, tourism, leisure and scientific services, located at Sant Frutós de Bages, 60 km north of Barcelona. The center includes the Benedictine Monastery of Sant Benet de Bages, recognized as one of the best medieval monastic sites in Catalonia, a four stars hotel, a convention center and a research center devoted to technological innovation in cuisine hosted by the Alicia Foundation.

Through guided tours and new audio-visual technologies, Mon Sant Benet offers its visitors an opportunity to become immersed in the monastic history and the modernist past of the center.

<http://monstbenet.com/ca>



Process¹⁶

The Món Sant Benet center is a project born with the aim of becoming a tourist reference in Central Catalonia. A project that seeks to foster economic development initiatives undertaken by Caixa Manresa in cooperation with public administrations and the private sector.

It all began in 2000, with the purchase of the Romanesque monastery of Sant Benet de Bages by Caixa Manresa, which entailed five years of planning and definition of content, and two more years of execution, with intense restoration actions of the monastery and construction of the new facilities, with a total investment of 71 million euros.

The development of the project can be structured in three differentiated phases: a first phase (1990-2000), prior to the purchase of the monastery; a second phase (2000-2004) in which the team is united to carry out the project and the central ideas are elaborated; and a third phase (2004-2007) corresponding to the realization of the project.

Món Sant Benet has two key thematic areas: the museographic project and the Alicia Foundation. It has an innovative medieval and modernist museography, which allows visitors to relive and understand more than a thousand years of the history of Catalonia. It provides tourist and pedagogical services, which give value to the monastery as a symbol of the history and culture of the country. The Alicia Foundation is a research center that has the support of the Generalitat of Catalonia and the Caixa Manresa Foundation. Alicia promotes high-level scientific research in the fields of food and health. At the same time, it seeks to enhance the country's culinary heritage and scientific innovation in gastronomy.

The complex also includes a convention and congress center, with 4,000 m², divided between the monastery and the factory building; A four-star Hotel Mundo; three restaurants: La Fonda, Món and L'Ó, the latter awarded with a Michelin Star; a tourist information center and a shop with the most representative gastronomical products of Catalonia.

Stakeholders/owners.

- Execution and coordination:
Catalunya-La Pedrera Foundation
- Idea, development and contents:
Transversal Producciones Culturales

Period of development

2000 - 2007

Impact

The success obtained, and the good expectations of the project allow us to think that it has provided a very important contribution to the economic, social and cultural development of the region. The project represents a new model of social, tourism and cultural management. In the first year after the inauguration, more than 200,000 people visited Mon Sant Benet.

¹⁶(Based on the research text of "Món Sant Benet: Utopia, ambició i passió")

Case 6 - "WE HUNTERS": INSTALLATION OF ULLDECONA



Basin on the Iberian Peninsula was recognized as a World Heritage Site by UNESCO in 1998, due to its exceptional picture of human life and fauna which provide particular information about the way our ancestors lived in the post-Palaeolithic era, 8,000 years B.C.

With 758 identified spots, the rock art sites are found in the coastal and inland mountain ranges of the Mediterranean Basin of the Iberian Peninsula over 1,000 kilometres of coast, from Catalonia to Andalusia, distributed across six autonomous communities: Andalusia, Aragón, Castilla-La Mancha, Catalonia, Murcia, and Valencia. The paintings are found in shallow open-air shelters, on front walls and sometimes on the ceilings of the shelters, surrounded by areas with high ecological and landscape values. The figures were painted mostly in red and black colors, with a lesser presence of yellow and white.

Most of the sites are located on public land (70%), ensuring public access. Of the total of the inventoried sites, 28% have restricted public access and 23% have a security system. With the aim of protecting the paintings, public authorities of the region have acquired some of the rock shelters.

As part of the World Heritage there is The Godall Mountain, located in Ulldecona, Montseni, with more than 380 figures distributed through 500 meters of rock shelters with motifs depicting archers, distinct animal species, abstract figures and hunting-related elements (animal prints, arrows, etc).

These rock-art settings constitute a unique and meaningful way for the understanding of the European prehistory. The paintings provide an insight into different social aspects as well as of the environment of the prehistoric inhabitants in the region as they became a way to communicate rituals and traditions shared within the community.

In order to facilitate access for visitors to the Ulldecona paintings, in 2006 the Center for the Interpretation of Rocky Arts "Abrics de l'Ermita" was built next to the rock shelters with the purpose of promoting education and appreciation for the rock arts through innovative graphic resources, photographs and tracing of the paintings. The center is part of the Rupestre Art Route created by the Museu d'Arqueologia de Catalunya.



Project concept

“We Hunters” consists in an interactive game displayed on a large format touch screen (240 x 180cm) installed in the Center for the Interpretation of Rocky Arts “Abrics de l’Ermita”. This multi-user installation of virtual heritage uses morphs from the rock shelters of Ulldecona such as archers and animals allowing users to interact with them while establishing hunting strategies, becoming a fun and educational experience. https://www.youtube.com/watch?v=E8_pYesEc_g

The game is intended to explain the hunting strategy used by prehistoric men. The game has no beginning or end, it is an open game that allows the user to imagine the scene that the painters of the cave paintings wanted to represent.

Process

The virtual heritage installation was a pioneer project in Catalunya developed by the Ulldecona Government with the aim to create innovative tools to promote the city cultural heritage.

The room with the installation has a rectangular layout with two windows that occupy one of the side walls. The City Council applied the necessary measures to achieve the lighting and technical conditions required for the best functioning of the installation. In order to achieve

the necessary lighting conditions, the store windows have been covered with black vinyl. The City Council, as stipulated in the economic proposal, took over the necessary works and the expenses that these works entailed for the completion of the project.

Visitors will find a screen of 180x240cm with the animated rock figures of animals relatively scattered as if they grazed. There is also the figures of the hunters who will be in the lower part of the screen. Animals are controlled by the system and, therefore, will show an autonomous behavior. The hunters, however, will remain still waiting to be controlled by the users. Visitors will have to approach the screen very close to control the hunter whom will move in the sense of the movement of the hand. In this way users will be generating a hunting situation with an individual or collective strategy based on the number of participants. The objective of the game is to get hunters to be able to capture as many deer as possible. Each user can control as many hunters as he can.

Stakeholders / owner.

The project was an initiative of the City of Ulldecona and was developed in coordination with the University of Pompeu Fabra and the Service of Occupation of Catalunya. Once implemented, the daily management was carried out by the City of Ulldecona.

Execution and coordination: Ulldecona City Government

Idea, development and contents:

Barcelona Media www.barcelonamedia.org

Nartex Barcelona <http://nartexbarcelona.com/portafolio/centre-dinterpretacio-de-les-pintures-rupestres-dulldecona-tarragona-joc-interactiu-nosaltres-cacadors/>

Technological development: Group of Experimentation and Interactive Communication of Pompeu Fabra University.

Scientific advice

Agustí Vericat, Director of the Center for the Interpretation of Rocky Arts Abrics de la Ermita.

Ramon Viñas, Researcher at IPHES, Catalan Institute of Human Paleoecology and Social Evolution.

Development time

Approximately 7 months, from June to July 2008.

Impact

- Visitor numbers
- Income generation
- Interaction with local economy society, tourist flows
- Research generation
- Educational system involvement/ school visits

Case 7 - ETHNOLOGICAL MUSEUM OF MONTSENY



The overall project and the cultural assets.

The Natural Park of The Montseny is the largest and highest massif located in the Catalan pre-coastal mountain range, covering an area of 30,120 hectares that are part of eighteen districts of the regions of Osona, La Selva and Vallés Oriental, all under the administration of the provincial councils of Barcelona and Girona. Its particular geography has provided a rich diversity of flora and fauna, and invaluable remnants from ancient cultures.

Some of the remnants come from the Neolithic period with remains of megaliths, and settlements of the Iberian, Roman and Middle Age periods composed of villas, walls, castles and temples located along the massif. As a proof of these human settlements, the local communities located through the Montseny continue to celebrate different traditions such as dances (Tirabou dance) and popular festivities (Pino de Centelles) inheritance from their ancestors.

For this attributes , in 1978 UNESCO included The Montseny in the World Network of Biosphere Reserves which is part of the Man and the Biosphere Programme (MAB)¹⁷. The Reserve aims to protect The Montseny natural and cultural legacy, as there is an intensive usage of its natural resources by private owners in the region as well as by tourists and visitors¹⁸ most of whom come from cities located nearby.

¹⁷ UNESCO's Man and the Biosphere Programme (MAB) is an Intergovernmental Scientific Programme that aims to establish a scientific basis for the improvement of relationships between people and their environments. <http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/>

¹⁸The Montseny attracts close to two million visitors yearly. http://www.barcelonaesmoltmes.cat/en/web/descobreix/detall/-/dades/H0XtQmAswXNg/detall/17_17002_18/parc-natural-del-montseny



Other important efforts focused on the protection of the natural park prior to the recognition of UNESCO were the creation of the Montseny Mountain Board, approved on September 15, 1928; The Special Plan of the Montseny Natural Park³, approved on July 26, 1977 and the Decree to create the Natural Park, approved by the Generalitat of Catalunya on April 10, 1987.

Due to the natural richness, the beautiful landscapes and the architectural and cultural heritage, The Montseny has become an important pole of attraction for visitors and tourists, developing an important infrastructure and tourist services represented by hotels, restaurants, cabins, cultural centers, guided tours, among others, boosting local economic development. It also represents an important space for the inhabitants of Catalonia and the rest of Spain to have a direct approach to their history and learn more about their culture and roots¹⁹.

With the purpose of documenting, protecting and promoting the cultural heritage of the Natural Park and Biosphere Reserve, the Ethnological Museum of Montseny was created in 1985, offering different exhibition rooms explaining the evolution of the human settlements in the Montseny throughout the history.

Project concept and history

The Ethnological Museum of Montseny (MEMGA) is housed within a seventeenth-century building called La Gabella, situated in the centre of the village of Arbúcies. The museum narrates in its fifteen permanent exhibition halls, the transformation throughout history of the communities who have lived and worked in The Montseny. The visit is complemented by the projection of the audiovisuals "Montsoriu Castle" and "Legends of Montseny". www.museuetnologicmontseny.org

The La Gabella building developed different activities over time: from a stock of basic products to a hostel for travelers and beggars. It was until the year of 1970, when the City of Arbúcies bought the building. At the beginning it was used as a warehouse and nine years later was given a cultural purpose with the establishment of a group called "Busqueda", which had the intention of recovering the local cultural heritage. The group was a pioneer in collecting photographic and oral information about the Montseny and its inhabitants. All the collected material became the basis of the MEMGA exhibitions. It was until May 1985 when the first phase of the Museum was inaugurated. Since then, the Etnològic Museum of Montseny is a center dedicated to research, conservation, dissemination, and exhibition of the cultural heritage of the Montseny massif.

The museographic approach

The museography focuses on three main stages: The First Settlers, Traditional Society and Industrialization. In The First Settlers exhibition, visitors can take a trip back in time to learn about life in prehistory, the Iberian and Roman world; as well as to understand the transformation that the landscape of the massif has undergone, mainly due to a long process of interaction between man and the environment. The section dedicated to the Middle Ages emphasises the social and economic transformation of the era, having the Castle of Montsoriu as an example of these social changes. Audiovisuals are used to enhance the learning experience of the Castle of Montsoriu, considered the best Gothic castle in Catalonia.

The second stage, Traditional Society, was structured around the farmhouse, from which the territory was exploited and society was organized, having as main activities agriculture, livestock and logging. During the nineteenth century these were the main economic activities of Montseny until, in the mid-twentieth century, a process of abandonment of the farmhouses began culminating in the 1980s.

¹⁹As an initiative of the provincial councils of Barcelona and Girona, the Special Plan of the Montseny Natural Park was updated and approved on December 11, 2008, conceiving the new master plan called the Special Plan for the Protection of the Natural Environment and Landscape of Montseny. <https://parcs.diba.cat/es/web/montseny/aprovacio-del-pla-especial>



The last stage, Industrialization (late 19th – beginning of 20th century), was a period where some of the biggest transformations in Montseny's society and economy occurred. The process of industrialization affected not only the economy but also cultural aspects. Coach bodies, wood turnery and the textile sector were the first industrial activities that had a strong link with the environment, either by the use of wood as a raw material or by the fundamental role played by water as a source of energy.

Guided tours are offered and designed for different types of audiences (children, families, specialized groups, etc.). The tours seek to generate emotions and sensations through the use of new generation audiovisual techniques.

Stakeholder/ Owner / Implementation coordination

City of Arbúcies

Provincial councils of Girona

Impact

- Visitor numbers and additional visitors attraction

7.2 GREECE / CENTRAL MACEDONIA / THESSALONIKI

The selected case, at this stage, is the Industrial Museum and Cultural and Educational Centre in Thessaloniki. It is essentially a museum of its own premises, since it exhibits industrial machines and artefacts found within or related to it and presents the memories acquired there. It was built in 1875 as a technical school for orphans and later turned into an industry and a foundry until the 1990's. Work on turning it into a museum began in 2011 and ended in 2015. The official opening took place in November 2017. Its objective is the presentation of the history of the technical schools which operated in similar institutions / orphanages, the techniques of the workshops and industries in the second half of the 19th century in Greece and the history of casting, one of the oldest techniques and the operation of foundries. The exhibition section was created using the widest possible range of cutting-edge methods of shaping, presenting and formulating the interpretive material, using modern exhibitionism principles, both in content and formulation.

For the selection of modern digital media, a survey investigated the potential, suitability and feasibility of their integration, a task to which related companies also contributed. The next steps were the conservation and digitization of the existing objects (machines, tools, drawings, records), documentation and support through additional sources (bibliographic research) and the collection and digitization of intangible material (testimonies, narrations, sounds). The technologies and tools finally used are:

- Immersed reality application, installed in a specially designed space, in which the evolution from the late 19th century city quarter to the today's modern city is illustrated experientially and the phases of the urban grid are represented in 3D.
- Interactive multimedia exhibit (info kiosk), in which the history of technical education is presented game-wise.
 - QR codes used to direct apps on mobile devices to display information about other technical schools of the same era.
 - Video projections of interviews of people who worked there describing the working conditions and sharing their memories.
 - Animation, video and sound of the machines while in operation.
 - Virtual tour of the museum's facilities and exhibitions through the museum's website.

Additionally, the integration of AR technologies has already been launched in collaboration with FORTH. The target audience consists mainly of school groups and visitors in the age of 25 to 45 who visit the museum either with their families or individually. Also, older visitors were made to feel welcome and



comfortable, while additional care was taken for people with disabilities providing special content and ensuring accessibility.

In the two months of the official operation there were about 1200 visitors. 600 of them were students. The site is also available for other cultural uses and events such as congresses, theatrical and visual events and installations, whose visitors amounted to an extra 200 people. Due to the very recent start-up and the digital media integration right from the beginning, their impact on visitor's flows cannot be evaluated. However, it has been noted that the digital media experience is very exciting to all visitors.

Concerning the business planning for the permanent operation the Industrial Museum and Cultural and Educational Centre is a non-profit organization financed by the State.

The conception, promotion and design of the project was done by the Architects, Museologists, Historians and the rest of the staff of the Service of Modern Monuments and Technical Works of Central Macedonia of the Hellenic Ministry of Culture and Sports (SMMTW-CM / HMCS), meaning that there was no an extra cost for these phases, the completion of which required about two years.

Criteria and conclusion of Northern Macedonia study and case

In conclusion, it is very important to note that the field of cultural heritage strategy and policy making²⁰ is an essential and very important element in Greece. Many cultural heritage projects are supported as cultural heritage is directly related in Greece with domains such as industry, education, tourism (which is the most important domain of economic growth^{21, 22, 23} due to the great number of tourists that Greece welcomes every year) etc. Specifically, the Industrial Museum and Cultural and Educational Center in Thessaloniki²⁴, supports many digital exhibitions with the help of modern digital media. It was discovered that these digital exhibitions were very exciting and fun for the visitors, something that could prove useful for bringing more visitors to the museum that way and thus contributing in cultural heritage preservation as well as the economic growth of the country. As a result, it is crucial to invest in cultural heritage projects as well as virtual museums, since this will bring more visitors to museums, something that will result in the greater spreading and preservation of cultural heritage across people and generations.

7.3 CYPRUS

Case 1 - MEDSTACH

A proposal for MEDSTACH Teaming Project under the Horizon 2020 Widening Programme was ranked of all proposals received from eligible countries in Phase 1 of the 2017 call. Should it succeed with its Phase 2 proposal a considerable resource will be released for research and innovation in Cultural Heritage in support of economic and social development in Cyprus and the Middle East, with DCH as a core strand. Project MedSTACH aims to establish Cyprus as an excellence hub in archaeology and cultural heritage in the Eastern Mediterranean region, capitalising on multidisciplinary research and technological innovation. To this end, key Cypriot public academic institutions and national policy makers and stakeholders are teaming up with

²⁰Ψηφιακή Στρατηγική για τον Πολιτισμό 2016-2022, Μίαπρωτοβουλία του Σωματείου «Διάζωμα» Με τη χορηγία του Ομίλου ΟΤΕ.

²¹Ψηφιακή σύγκλιση, Πρόταση Σχεδιασμού και Κατάρτισης Αναπτυξιακού Προγραμματισμού για την περίοδο 2014-2020, Απρίλιος 2013

²²DigitalRecoverythroughinnovation 2020, ΕΥΔΕΠ «ΨηφιακήΣύγκλιση», Φεβρουάριος 2013.

²³Τζαμαλούκας Κωνσταντίνος, Γεντίμης Αθανάσιος, Παπαβασιλείου Συμεών, Επικ. Καθ. ΕΜΠ, Διαμόρφωση στρατηγικού πλαισίου αναπτυξιακής πολιτικής 2014-2020, για το Θεματικό Στόχο 2 «Ενίσχυση της πρόσβασης και της χρήσης καθώς και της ποιότητας των Τεχνολογιών Πληροφορικής και Επικοινωνιών, ΓΕΝΙΚΗ ΓΡΑΜΜΑΤΕΙΑ ΔΗΜΟΣΙΩΝ ΕΠΕΝΔΥΣΕΩΝ – ΕΣΠΑ, Ε.Κ. «Αθηνά», Φεβρουάριος 2013

²⁴Michael Tsioumas, Records of Service of modern monuments and technical works, Hellenic Ministry of Culture and Sports, Service of Modern Monuments and Technical Works of Central Macedonia, Herodotou str. 17, 540 03 Thessaloniki, Greece, mtsioumas@culture.gr

leading international research and academic institutions to lay the groundwork towards creating the Eastern Mediterranean Science and Technology Centre for Archaeology and Cultural Heritage (acronym MedSTACH).

The mission of MedSTACH is the development of the necessary scientific and technological environment for the advancement of the state-of-the-art in archaeology and cultural heritage research in Cyprus, the Eastern Mediterranean region, and beyond; this will be accomplished by strengthening regional wellsprings of scientific and technological expertise, capacity for innovation, and synergies among related Science, Engineering and Technology disciplines. The Centre's mission is fully aligned with the Smart Specialisation Strategy for Cyprus, as it responds to the need for the study, protection, promotion and ultimately valorisation of Cyprus's unique archaeological wealth, as well as the promotion of alternative forms of thematic (cultural heritage) tourism. MedSTACH, a first-ever established alliance of this scale in Cyprus for archaeology and cultural heritage, is expected to dynamically promote excellence in relevant research fields and to enhance Cyprus's role as a pole of attraction for scientists and researchers from the Eastern Mediterranean region and the rest of the world, while promoting in a sustainable way smart specialisation and new job creation

A number of World Heritage sites are featured by UNESCO. These and others have obvious potential for development in a touristic context. They include

Case 2 - PAINTED CHURCHES IN THE TROODOS REGION

This region is characterized by one of the largest groups of churches and monasteries of the former Byzantine Empire. The complex of 10 monuments included on the World Heritage List in 1985, all richly decorated with murals, provides an overview of Byzantine and post-Byzantine painting in Cyprus. They range from small churches whose rural architectural style is in stark contrast to their highly refined decoration, to monasteries such as that of St John Lampadistis. CUT and its international partners have conducted work to digitise, create 3D models and document holistically the church at Asinou and the Monastery at St Neophytos, in part under the Marie Curie ITN-DCH research training programme 2014-17, which has created a basis for the innovative exploitation of DCH in Cyprus.



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Case 3 - CHOIROKOITIA

The Neolithic settlement of Choirokoitia, occupied from the 7th to the 4th millennium B.C., is one of the most important prehistoric sites in the eastern Mediterranean, inscribed on the World Heritage List in 1998. Its remains and the finds from the excavations there have thrown much light on the evolution of human society in this key region. Since only part of the site has been excavated, it forms an exceptional archaeological reserve for future study.



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Case 4 - PAPHOS

Paphos, inscribed on the World Heritage List in 1980, has been inhabited since the Neolithic period. It was a centre of the cult of Aphrodite and of pre-Hellenic fertility deities. Aphrodite's legendary birthplace was on this island, where her temple was erected by the Myceneans in the 12th century B.C. The remains of villas, palaces, theatres, fortresses and tombs mean that the site is of exceptional architectural and historic value. The mosaics of NeaPaphos are among the most beautiful in the world. Paphos was European Capital of Culture 2017



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8. THE INTERREGIONAL AND EUROPEAN COMPARATIVE APPROACH AND BENCHMARKING

Following the results of the macro and micro analysis in the 3 European regions, in the final part of the work (D6.2), a comparison will be undertaken of the findings in terms of policies of digital heritage and virtual multimodal museum support policies and practices and their impact and effectiveness in regional growth. The comparison will take into account the sectoral impact emphasising tourism, and leisure as well as research in IT and humanities enhancement.

Conclusions will also be extracted by analysing difficulties, obstacles, lack of resources or know how, lack of policies and incentives, administrative obstacles, social acceptance, private sector support etc that could raise the risks and lead to wrong or less effective decisions in a project's implementation and operation.

Finally, the effort will lead to policy recommendations concerning specific financial instruments, and incentives to address the difficulties and demand of cultural assets owners for development of digital access to cultural heritage and new digital assets.

When the study is at a more advanced stage, all partners involved in the WP will be asked to take into account the results, compare them with the other European regions, and their own countries and benchmark policies and extendable results at the European level.

Moreover, the data and conclusions study in the three regions will be provided and presented to the other partners of ViMM, in order to benchmark them with the general policies in their respective European regions for feedback, in order to achieve a deeper understanding of the differences of digital heritage and virtual museums policies and impact and expectations, in periods of economic crises compared to those of more or less normal socioeconomic situation.

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