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1. Executive Summary

ViMM is a Coordination and Support Action (CSA) proposal under call Cult-Coop-8-2016 for Digital Cultural Heritage (DCH) and in particular, Virtual Museums (VM), featuring a social platform for European digital heritage www.vi-mm.eu.

This document presents a Roadmap and Action Plan for virtual museums and digital cultural heritage and gives an overview of the process that resulted in this Roadmap and Action Plan. It is the outcome of a multi-stage process involving experts and stakeholders from the beginning of the project¹. The current document represents this work - a process of continuing concretization, moving from statements of beliefs, aims and policies, towards a plan for action, set within a defined 5-year timeframe - as the project's Deliverable *D7.3 Roadmap and Action Plan*.

The Roadmap and Action Plan presented here is a revised version following a critical discussion of a draft at a review meeting in Crete at the end of September 2018. In agreement with the EU-Commission, the submission of the document, planned for the end of October 2018 (M25), was postponed to the end of the project (end of March) in order to take into account this discussion, together with the results of remaining events where the Roadmap and Action Plan was discussed, validated and prioritised.

Events included

- a workshop organised on 1 November 2018 within the EuroMed 2018² conference in Nicosia, Cyprus,
- a conference of key experts held in Vienna on 14 and 15 February 2019
- a conference involving leading European and International stakeholder organisations in Paris on 14/15 March 2019

Role of this Report

The D7.3 Roadmap and Action Plan for VM is a key deliverable, produced during the final stage of the project and that corresponds with Milestone 5 of the project plan. It is followed by one last milestone M6 International Conference. Together with the ViMM Manifesto the Roadmap and Action Plan represents a set of strategy papers that provides a basis for the development of future EU-wide funding programmes and defining both objectives and

¹ Documents already submitted, such as D3.2, D7.1, D7.2, contain a description of the individual steps of the preceding multi-stage process up to the Manifest (D7.2).

² <https://www.euromed2018.eu/index.php/workshops>

measures to achieve those objectives in order to ensure that the cultural sector can not only keep pace with, but maximise the benefits of, digital transformation.

Relationship with other documents and tasks of the project

This document is based on the D7.2 ViMM Manifesto³, which summarizes the findings of a previous consensus-building workshop of key stakeholders at a Berlin meeting in April 2018 (Task 7.1). The Manifesto describes selected key issues in 10 different fields important to the future development of Digital Cultural Heritage and the support for the institutions within. This document represents a continuation of the working process by compiling, specifying and coordinating the proposals made by experts. The content of the RM/AP, in particular the content of the first three of the four Aspects (see section 7, p.13f) was discussed, validated and prioritized at a meeting of experts held in Vienna on 14 and 15 February 2019 (Task 7.4). The last aspect was discussed at a 2-day international conference (Task 7.5) involving leading European and International stakeholder organisations in Paris on 14/15 March 2019, the results to be reported in D7.4 International Conference.

2. Document overview

This document presents a Roadmap and Action Plan for Digital Cultural Heritage Virtual Museums. It is a result of a multi-stage process of engagement of experts and stakeholders. This process enabled a broad and open approach to addressing, discussing and presenting the diversity of Virtual Museum (VM) and Digital Cultural Heritage (DCH)-related themes. Based on the input of experts and stakeholders a consensus-building process identified key issues that resulted in the ViMM Manifesto. Based on the Manifesto, this Roadmap and Action Plan for Virtual Museums has been developed.

This document is structured as follows:

- Two introductory sections describing the process of the work that has been accomplished and the intention of this paper.
- A brief description of the wider context, which provides an assessment of the conditions and prerequisites, both seen as obstacles and opportunities, for efforts to preserve and make accessible cultural heritage through digitisation and to advance this process through innovation.
- The Roadmap describing the route which progress in digital transformation needs to follow.

³ <https://www.vi-mm.eu/2018/09/17/the-vimm-manifesto-for-digital-cultural-heritage/>

- The Action Plan describing four priority areas where action is seen to be needed, with an outline timeframe:
 - I. Research and innovation under Horizon Europe
 - II. A European Competence Centre network in Digital Cultural Heritage
 - III. Human Resources, education and training
 - IV. Policy and international cooperation

3. Introduction

ViMM is a Coordination and Support Action (CSA) proposal under call Cult-Coop-8-2016 for Digital Cultural Heritage (DCH) and in particular, Virtual Museums (VM), featuring a social platform for European digital heritage www.vi-mm.eu. As such, it sets out to develop and maintain a sustainable platform engaging a large number of key stakeholders and communities of practices in interaction about how to improve collaboration and comprehension among the entire community, in order to build up a common roadmap for future activities.

ViMM has therefore organized, encouraged and enabled debate and discussion on relevant technical, ethical and scientific/cultural issues which will in themselves add to the store of knowledge owned by curatorial specialists in museums and archaeological sites etc. ViMM also seeks to engage and sustain the involvement of all stakeholders wishing to contribute to decision making process by a variety of methods including a structured step-by-step decision-making tool for the creation and operation of projects and activities by Cultural Heritage Institutions (CHI) and among social and economic partners.

Following a solid methodological approach, detailed outputs were produced over a period of 9 months in 2017, during which 21 invited expert Working Groups identified key issues and made proposals for widespread adoption or implementation in seven defined Thematic Areas (TA) – the ‘seven Ds’: Definitions-Directions-Documentation-Dimensions-Demand-Discovery-Decisions.⁴

This initially broad and open approach sought to address, discuss, and map the diverse nature of VM and DCH-related issues such as technological innovation, demands on documentation, need for contextualisation and preservation. It was followed by a consensus-building process to select the key issues through Action-wide coordination activities, including the Berlin meeting in April 2018. Based on the findings of the Working

⁴ A summary of the results was published on the platform: <https://www.vi-mm.eu/2018/02/01/output-of-the-working-groups/>



Groups of each Thematic Area from this meeting, which was attended by more than 100 experts, a synthesis of 48 draft propositions were discussed ranked and subsequently a synthesis produced, which became the basis for editing as the draft 10-point ViMM Manifesto.

The draft Manifesto was widely circulated via the ViMM Platform, social media and promoted at dissemination events, including the European Year of Cultural Heritage week in Berlin (18-24 June 2018). Numerous comments helped to produce the ViMM Manifesto, the final of several drafts of which was published in September 2018. A summary⁵ has also since been published on the ViMM platform.

The next sequential objective during the final year of the CSA was to refine all preceding actions and activities into a Roadmap and Action Plan (RM/AP). The content of the RM/AP, in particular the content of the first three of the four Aspects (see section 7) was discussed, validated and prioritized at a meeting of experts held in Vienna on 14 and 15 February 2019. As a result of that, in accordance with the Description of Actions, the current document represents this work as the project's Deliverable D7.3 *Roadmap and Action Plan*. The fourth Aspect – Policy and international cooperation is planned to be discussed at a final meeting involving leading European and International stakeholder organisations in Paris on 14/15 March 2019, the results to be reported in D7.4 *International Conference*.

The Roadmap and Action Plan are built on the Manifesto. Together they represent a process of continuing concretization, moving from statements of beliefs, aims and policies, towards a plan for action, set within a defined 5-year timeframe. Therefore, this paper is designed to incorporate the positions and proposals of the Manifesto, together with subsequent discussions.

⁵ <https://www.vi-mm.eu/2018/09/17/the-vimm-manifesto-for-digital-cultural-heritage/>

4. The intention of the Roadmap and Action Plan

According to its Description of Activities (DoA), ViMM should lead to a widely-accepted 5-year roadmap for future activities by producing:

“a Manifesto, Roadmap and Action Plan designed to secure wide understanding and a significant role for Virtual Museums in the political context of the European Year of Culture and beyond” (DOA, p.76)

“Following this, an Action Plan and Roadmap for VM in the following 5-year period, suitable for promotion in the context of the European Year of Culture 2018, will be compiled and disseminated through all available channels. By the end of Month 25”.

However, at the Period 2 Review of the project in November 2019, it was agreed that the work on the completion of the RM/AP should be extended until the end of the project.

The DoA also states that *“The Plan and Roadmap will include proposals agreed by the consortium and validated with its community of stakeholders for sustaining the social platform and the ViMM community”.*

This work will now be presented as part of D1.6 - *Plan for use and dissemination*, in effect the project’s Exploitation Plan.

We consider this Roadmap and Action Plan to be:

- a descriptive tool that gives an overview of general issues and challenges which provides a vision for future developments and establishes an approximate timeframe.
- a strategic tool - a guideline for developing a new Agenda for DCH - that addresses the requirements to achieve goals and assists future planning by decision makers, political authorities like the EU Commission and other fund holders.

The Manifesto has thus been translated into more practical detail in the Roadmap and Action Plan.

5. Current situation

Cultural heritage is a significant force for 21st century Europe. Not only is it at the heart of what it means to be European, it is being discovered by both governments and citizens as a means of improving economic performance, people's lives and living environments. The wide range of events and initiatives in the European Year of Cultural Heritage 2018 (EYCH2018) have not only promoted a sense of the cultural diversity in Europe and encouraged people to share and appreciate Europe's rich cultural heritage but are also drawing attention to the challenges that Cultural Heritage Institutions (CHI) are facing, such as the impact of digital transformation.

In general, society is increasingly driven by a constantly advancing digital technology. At the same time, there is a considerable gap between the uptake of new technologies by society in general on the one hand, and by CHI on the other. CHI, which have something of a reputation of being conservative and slow to accept innovations, must adapt and become engaged with these technological advances. As their strong participation in numerous DCH projects⁶ at European, national or local level in the past two decades shows, significant numbers of CHI have shown willingness to face the challenges of digital transformation and are prepared to review their perspectives in this respect.

CHI across Europe have started questioning and re-thinking their role, previously characterised by three issues: Conservation, Research (including Documentation) and Communication, in favour of investigating new operational models based on insight into the multiple benefits of digitisation. Technological and digital innovations offer new tools for the preservation of CH and facilitate access to both tangible and intangible CH, for a wider public and for experts. At the same time CH plays an important role in promoting innovative technologies to support cultural and creative industries and to act as a driver for growth and jobs. The economic, social, cultural and environmental impact of our cultural heritage is presented, for example, with conviction in the report of Cultural Heritage Counts for Europe⁷.

It is estimated that only about 15% of cultural heritage resources held by CHI have been digitised⁸, of which number only 36%, is online for general use.⁹ The proportion of DCH items

⁶ Such as projects funded by the EU Commission: Europeana, V-MusT.net, Inception, Carare, 3D-Coform, 3D-icons, etc.

⁷ http://blogs.encatc.org/culturalheritagecountsforeurope//wp-content/uploads/2015/06/CHCfE_FULL-REPORT_v2.pdf

⁸ <https://www.governmenteuropa.eu/digitising-cultural-heritage-europeana/85551/>

⁹ https://pro.europeana.eu/files/Europeana_Professional/Projects/Project_list/ENUMERATE/deliverables/DSI-2_Deliverable%20D4.4_Europeana_Report%20on%20ENUMERATE%20Core%20Survey%204.pdf

in European CHI to which descriptive metadata has been applied is around 51%¹⁰, which significantly restricts their reusability.

But digitising Europe's cultural heritage is a costly task. The findings of the 4th ENUMERATE core survey¹¹ indicate that expenditure on digital collections amounts to approximately 450 Million Euro, mainly covered by the institutions themselves. Thus, Europe's CHIs already spend a considerable amount of time, money and other resources to digitise their extraordinarily rich and diverse cultural heritage collections, both to support preservation of CH and to promote new models of public engagement with it.

Technological innovations such as XR¹² offer completely new possibilities in this respect. A recent study about Virtual Reality (VR) and its potential for Europe carried out by ECORYS, commissioned by the Global Virtual Reality Association (GVRA)¹³, comes to the conclusion that VR has gone beyond its exploratory stage and reached a turning point for large scale adoption, leading to a stable growth of the VR & AR markets in Europe. The study predicts an increase of the production market of between €15 billion and €34 billion by 2020, directly or indirectly accounting for 225,000 to 480,000 jobs.¹⁴

Despite this, achievements to date are relatively modest and further investment is needed. When it comes to implementing modern digital technology, CHI often lag behind. A brief survey carried out by the ViMM consortium provides a number of reasons that constitute the main obstacles for employing digital approaches. The report presented by ViMM Working Group 1.3 identifies the following three main challenges:

“Money was named as biggest obstacle. This comprises lacking funding opportunities for digital activities, costs for hardware and software as well as budget priorities for non-digital activities within organizations.

Many participants estimate a missing awareness as a big obstacle. This relates to aspects such as a generation gap in terms of digital literacy and frequency of use of digital tools as well as a general fear of or resistance to digital methods or – vice versa – missing awareness

¹⁰ https://pro.europeana.eu/files/Europeana_Professional/Projects/Project_list/ENUMERATE/deliverables/DSI-2_Deliverable%20D4.4_Europeana_Report%20on%20ENUMERATE%20Core%20Survey%204.pdf

¹¹ https://pro.europeana.eu/files/Europeana_Professional/Projects/Project_list/ENUMERATE/deliverables/DSI-2_Deliverable%20D4.4_Europeana_Report%20on%20ENUMERATE%20Core%20Survey%204.pdf

¹² For the convenience of the reader, the term XR is used in the following as an umbrella term for virtual, augmented and mixed reality, as well as for 3D models.

¹³ VIRTUAL REALITY AND ITS POTENTIAL FOR EUROPE; <https://www.gvra.com/research/>

¹⁴ In terms of global growth Goldman and Sachs Investment Research forecasts a growth of \$80bn to \$180bn in revenue by 2025. Source: <https://www.goldmansachs.com/insights/pages/technology-driving-innovation-folder/virtual-and-augmented-reality/report.pdf>

of limitations and requirements in the digital world. Finally, a lacking vision of utilizing digital approaches as well as institutional conservatism and tradition were named as hindrances.

With regards to human resources, the lack of **competency** and skills especially in technical domains was frequently named. This closely relates to the frequently mentioned problem of hiring **qualified staff** skilled in cross-disciplinary cooperation and/or computing. Finally, also **training** opportunities and resources were named as lacking yet.”

What are main obstacles for employing digital approaches?

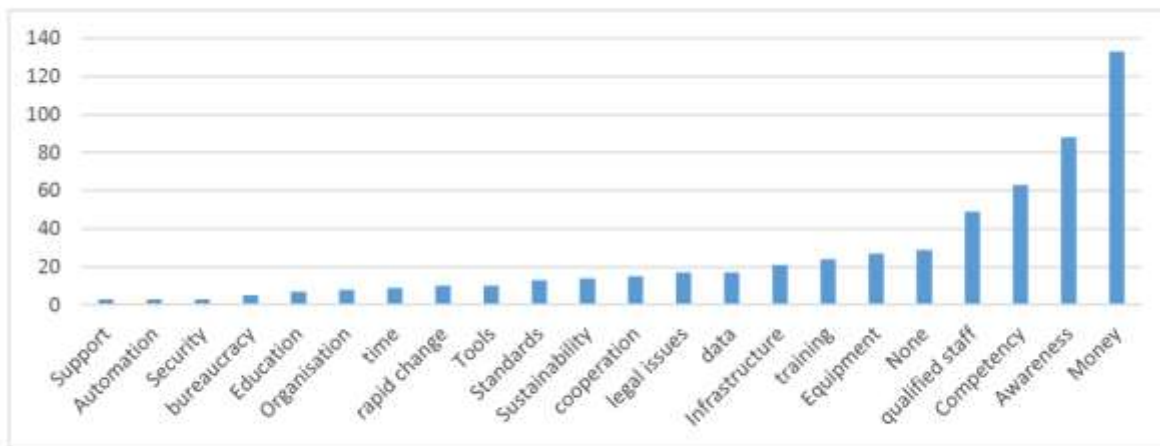


Fig. 1: What would you estimate as main obstacles for employing digital approaches in your organisation? (n=624 items, n>2)

The highly fragmented approach of digital initiatives across Europe, leading to a dispersion of resources, is also an obstacle to generating the optimal benefits of DCH for society. Better communication and cooperation between stakeholders involved is necessary.

Culture is increasingly seen as the new cement for social cohesion and cultural identification of European communities. Cultural Heritage in general is a powerful asset that can help foster the sense of belonging for all citizens as, for example, stated in the Europa Nostra Issues Statement.¹⁵ Especially in the light of recently increased migration flows and the rapidly changing socioeconomic mechanisms and technology, cultural heritage should be a source for advancing inclusive, innovative and reflective societies.

A paradigm shift in cultural policy becomes necessary, if cultural institutions are to be more open to the outside world and audiences are to be more involved in communication. The preservation and promotion of cultural heritage through new technologies will contribute to a better understanding of our common past together with actions to valorise, conserve, protect and preserve Europe's heritage. It is critical importance to recognize and then to realise the full potential of this.

¹⁵ <http://www.europanostra.org/wp-content/uploads/2018/03/cultural-heritage-key-resource-EU-future-cohesion-policy.pdf>

6. The ViMM Roadmap

The starting premise of ViMM is that the EU can be a worldwide leader in the promising and growing field of VM in particular and DCH in general. Technological innovation, research and development through public funding at European and national level are among Europe's particular strengths that make it possible to be an important player in the global landscape. Europe also has a cultural diversity that allows for rich storytelling, a skilled workforce and is known for its high-precision manufacturing and its tradition of cross-institutional cooperation.¹⁶ By using digital technologies for research, preservation, presentation and education, CHI become part of the XR ecosystem. They provide a domain for the development and application of XR that can generate cross-sectoral impulses.

In order to capitalise on the momentum, a strategy must be developed in which objectives and steps for implementation are defined. The ViMM Manifesto with its broad and comprehensive proposals in ten areas lays the foundations for a future strategy in VM/DCH. The Roadmap confirms the vision formulated in the Manifesto. In taking up proposals made in the Manifesto, this Roadmap and Action Plan (RM/AP) is the culmination of a process that provides a more focused framework for actions organized. First step was to merge the ten sections of the Manifesto into the following five consolidated Action Areas.

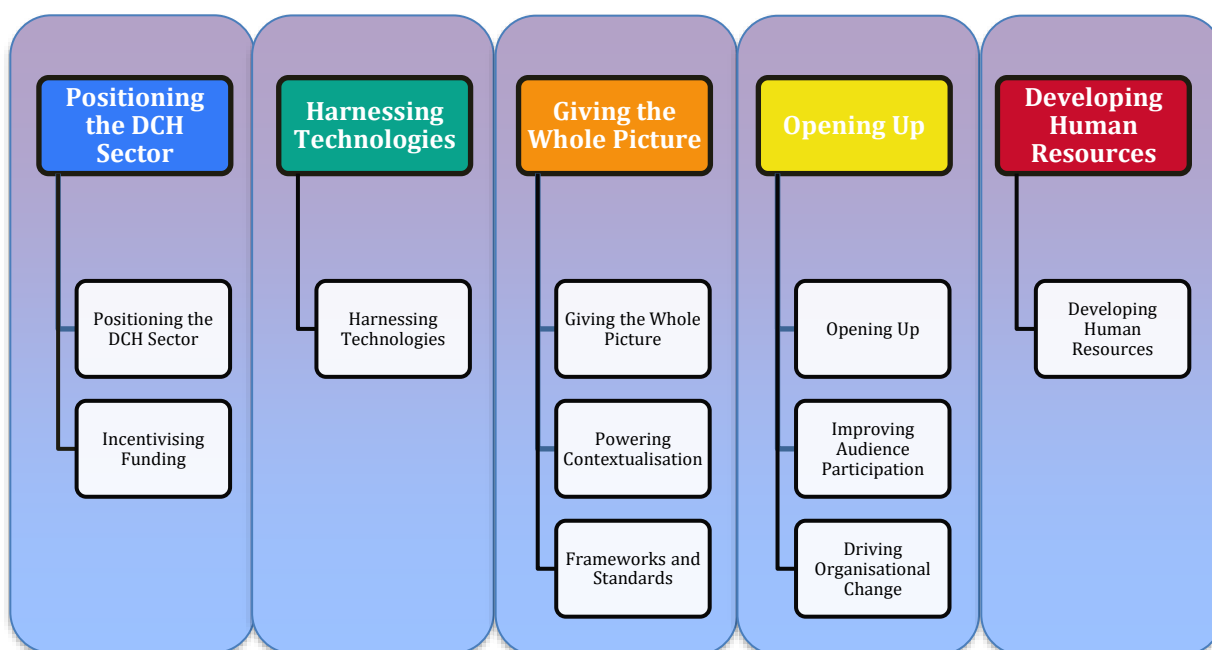


Figure 1 ViMM Manifesto sections corresponding to ViMM Roadmap Action Areas

¹⁶ "Virtual Reality and its Potential for Europe", ECORYS, 2017.

To each of these several **types** of (partly overlapping) activities can be assigned, such as: Policy making, Funding, Research and Development, Dissemination, Education and Training, etc. The following diagram illustrates the interdependencies of the five action areas.

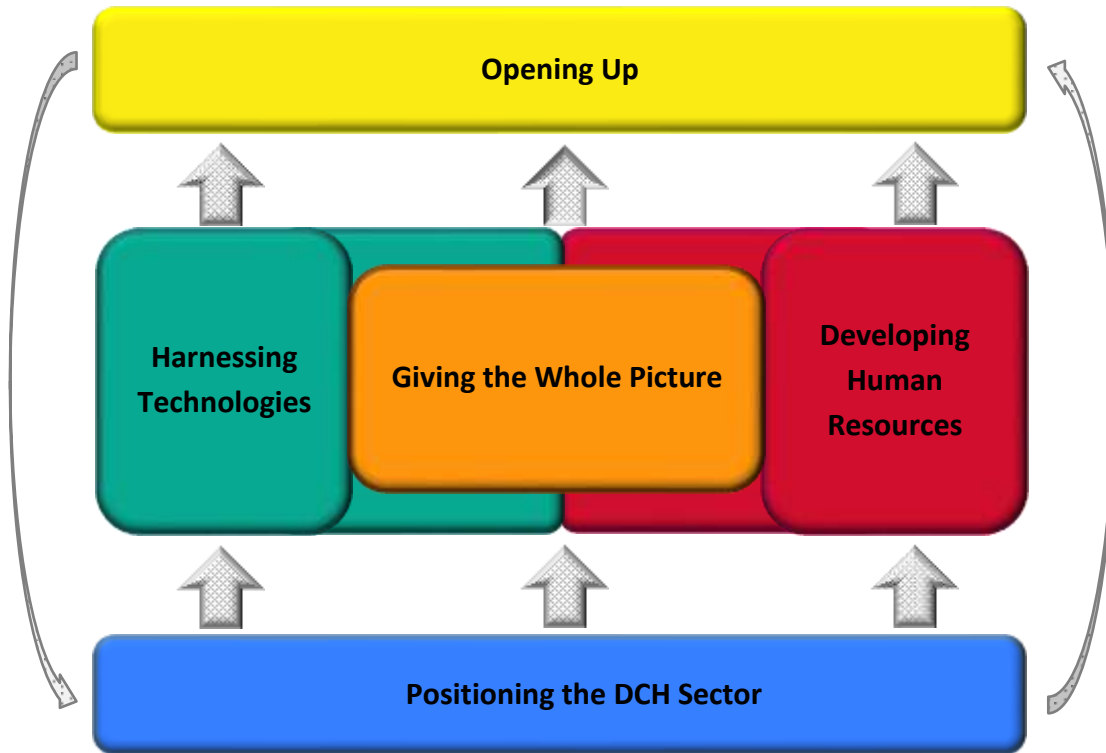


Figure 2 Interdependencies between Action Areas

7. The ViMM Action plan

The Action Plan gives an overview of the implementation of the proposed measures within a timeframe set from 2021 to 2025. Four key **aspects** of the action required are identified:

- I. Research and innovation under Horizon Europe
- II. A European Competence Centre network in Digital Cultural Heritage
- III. Human Resources, education and training
- IV. Policy and international cooperation

At the Validation event in Vienna, the first three of these Aspects of action were presented to a group of over 30 experts and subject to their discussion, analysis and feedback in breakout groups, making use of an online tool called Realtime Board Priority Matrix¹⁷.

¹⁷ <https://realtimeboard.com/templates/priority-matrix/>

The experts were divided into the following groups for the whole exercise:

Group 1	Group 2	Group 3
1. Piet Jaspaert	1. Graham Bell	1. Zako Bernards
2. Anne Grady	2. Vasco Fassina	2. Albert Gauthier
3. Susan Hazan	3. Petros Patias	3. Corine Steinsznaider
4. Sander Muenster	4. Christer Gustaffson	4. Chris Vastenhou
5. Vincent de Koning	5. Blair Parkin	5. Michael Tsioumas
6. Nils Huebner	6. Nikos Grammalidis	6. Bogdan Steh
7. Estelle Emeriau	7. Francesca Guerrera	7. Gilbert Soeters
8. Constantine Stephanides	8. Marc Grellert	8. Bente Maegaard
9. Andrea Taramelli	9. Sophia Augerinou	9. Marc Hernandez
10. Athanasios Sideris	10. Stefanie Rammel	10. Stephanie Wefers

I Research and innovation priorities under Horizon Europe

ViMM has provided the European Commission with detailed drafts of proposed calls for research it recommends being issued in the field of ICT for DCH within the forthcoming Horizon Europe programme, the planned scientific research initiative which will succeed the current Horizon 2020 program over the years 2021-2027.

Six research call texts were initially proposed to the Commission of which four were accepted for further consultation within the Commission, while two (numbers 2 and 7 in the list below were subject to queries or a request to reconsider/reformulate. The suggestion of an additional call topic on 3D standards was also made.

Six of the topics were presented for consideration to the experts in Vienna (including 3D standards but excluding topic 7 from the list below, based on initial feedback from the Commission. Following the feedback from the experts in Vienna, all 7 topics were submitted as revised texts to the Commission.

These full texts will remain in confidence while being considered by the Commission and until they may or may not be published within the research programme context. They form a Confidential Annex to this Deliverable.

The seven draft call texts delivered covered the following broad areas:

1. **Harnessing key technologies for exploitation of Digital Cultural Heritage (DCH)** such as Artificial Intelligence (AI) and machine learning, cloud computing, complex big data analysis and blockchain technology for the purposes of curation and exploitation of DCH, mass digitisation and automated information extraction.

2. **Deploying technologies to engage wider audiences for DCH**, including adaptive services, cognitive computing, cloud-based apps and more holistic, user-oriented documentation.
3. **Creating smart, enriched, contextualised experiences and dialogue in Digital Cultural Heritage** through XR technologies which generate meaning for the user through simulation, storytelling, gamification, ‘presence’ and sensory perception.
4. **Sustainable Infrastructure for Digital Transformation of Cultural Heritage Institutions** through a multi-faceted approach which addresses major challenges such as interoperability, 3D/XR content infrastructures, frameworks for rights and standards and impact measurement methodologies.
5. **Holistic documentation of 3D Heritage** The value of 3D as a source of knowledge in DCH can be substantially increased and extended by more holistic, inclusive and systematised approaches to its documentation, vocabularies and expressions of relationships. Methodological standards and common tools are needed for acquiring, processing, storing, presenting and accessing a full range of elements of the story of a site, monument or artefact are currently lacking.
6. **Preserving and exploiting born digital cultural assets**, often created by individuals, on social media and through CHI and community crowd-based initiatives.
7. **Full accessibility of DCH through socially inclusive technology** supporting *Cultural heritage for an inclusive Europe*, one of the 5 action areas for the European Framework for Action on Cultural Heritage, addressing the needs of people affected by physical or cognitive disabilities or other forms of disadvantage attributable to their social and economic status through access and exposure to DCH.

With the exception of the last topic, experts evaluated these topics during a validation event in Vienna using a Priority Matrix Tool. According to criteria such as important/unimportant as well as urgent /not urgent topics were assigned to a 4-field matrix. Points were awarded by each group according to the following scale:

- 3 – Important and urgent
- 2 – Important not urgent
- 1 – Urgent not important
- 0 – Neither important nor urgent

The following summary of the results shows the ranking of all actions proposed in the key area I. Research and Innovation under Horizon Europe in relation to their importance and urgency as assessed by the experts.

	I/U	I not U	U not I	Neither	Total
1. Key technologies	6	2			8
3. Contextualised experiences	6	2			8
5. 3D Standards	6	2			8
4. Infrastructure	3	4			7
6. Born digital cultural assets	3	4			7
2. Engage audiences	3	2		0	5
7. Socially inclusive Technology	Not considered				

II A European Competence Centre in Digital Cultural Heritage

Shared knowledge hubs can address sector-wide issues, enable cross-institutional and interdisciplinary synergies and open opportunities for growing together in an efficient and sustainable way. This can empower smaller actors to become more competent thus increasing overall competitiveness and productivity in a sector. The DCH sector is in need of such infrastructures which are currently partially realised in limited scope through platforms such as Europeana Pro and other previous initiatives.

It is understood that the European Commission will issue a call for a Competence Centres in DCH during 2019 as a final action in this area under Horizon 2020. The SUCCEED action under FP7 has previously provided an informative roadmap for the sustainability of Competence Centres¹⁸ in the area of digitisation and digital preservation from which significant learning can be derived.

Such a Centre can play an important role in providing access to and interpreting the results of the research recommended in Section I above. Furthermore, using this framework, the Centre will serve as a focal point for collecting and exchanging knowledge and information which addresses a range of DCH related issues and will design and carry out interlocking activities which, where appropriate, will become a basis for sustained services. This will establish a basis for rapid and widespread application of innovations in the field of DCH including awareness raising and promotion; key studies and frameworks; tools and applications; identifying best practices; standards review and initiation.

¹⁸ http://www.succeed-project.eu/sites/default/files/deliverables/Succeed_600555_WP7_D7.7_RoadmapForSustainableCentresOfCompetenceToSupportDigitalLibraries_D.pdf



The 'nodes' of such a Centre could be networked across Europe and if well operated, can play an important role in consulting, advising upon, pre-empting and resolving technology and implementation issues experienced by CHI and DCH practitioners nationally and regionally. Such nodes can be chosen from among a variety of institution types which have appropriate expertise and capacities such as: research centres, aggregator services in the Europeana ecosystem, national and regional level CHI and others.

It is recommended that the Competence Centre network should maintain and further develop an interactive online platform, building on that created by the ViMM CSA, supported by an extended network building on those created by ViMM, Europeana and national initiatives such as Museum 4Punkt0, as a basis for communication. It should be supported by an expert advisory board.

Among other important coordinated activities to be considered for a distributed Competence Centre network are:

Awareness raising/promotion

Organising awareness raising among museums and DCH stakeholders throughout Europe by promoting:

- Digital transformation: visioning digital services; incorporating technological solutions within their day-to-day responsibilities; and encouraging regular assessment of organisational 'readiness' for DCH.
- Use of open source software tools and standardised cloud-based solutions in order to ensure long-term usability of DCH assets.
- Contextualisation e.g. through campaigns about the importance of linking virtual objects with context and their historical, cultural, technical background and thereby increasing the relevance to re-usability.
- Initiatives designed specifically to develop capacity in small and local cultural institutions, for example by providing tools and training.
- DCH business models for cultural institutions – matching companies to projects to seek out funding opportunities and sharing resources.
- Collaborations and teaming between institutions, in both private and public sectors.

Key studies and frameworks

Awareness raising should draw upon increased knowledge and certainty gained by carrying out studies and surveys, in conjunction with leading specialists, in areas designed to:

- Analyse how CH institutions establish strategies and processes for DCH projects and how they organise administrative and governance structures for effective internal and external decision-making processes, involving policy makers, administrations and communities.
- Analyse the nature and extent of specific types of demand in support of defining the investments needed by CHI.
- Advance and update the conceptualisation and typology of virtual museums such as those developed by EPOCH, VMust and ViMM.
- Assess the challenges of legal frameworks and licencing regarding the presentation of digital content by cultural institutions
- Evaluate ethical practices and policies.
- Examine the needs of users of DCH, in areas such as the use of XR media and the development of scalable and /or generic solutions.

Best practices and lessons learned

Studies, surveys and critical reviews will be an important means of identifying best practices in various specific fields such as:

- Participatory design strategies and collaborative approaches for co-creation of DCH services.
- Presenting the benefits of digitisation of cultural heritage for different stakeholders.
- Technologies for the creation and presentation of cultural heritage objects.
- The extent and impact of crowdsourcing and community initiatives in DCH.
- Impact assessment based on mature and standardised processes as part of projects funded and/or carried out by public and private institutions in order to improve efficiency and effectiveness of the use of resources.
- DCH in social innovation.

Knowledge-base, tools and support

The activities of the Centre should include the maintenance of a knowledge base/platform available to all including:

- Studies, reports, data and support for academic publications.
- A **Technology Watch** to monitor and assess trends in evolving technologies in respect of their potential applicability for CHI. This should incorporate:
 - an online inventory of state-of-the-art DCH applications and solutions, accompanied by examples and use cases (including from previous EU, transnational and national projects disseminating the extent of their success and reasons for failure);
 - monitoring and assessment of evolving technology trends in other sectors, in respect of their potential for CH.

- a centralised access point which enables further development and reuse of prototypes and tools.
- An online **help-desk** to respond to specific requests for information from CHI and DCH stakeholders.
- Specialised **training** activities in response to established demand.
- Bespoke support activities where costs are covered by the requesting organisation(s).

Standards review and initiation

The work described above will create a strong basis for identifying and confirming areas in which standards are missing or in need of improvement, for example to ensure improved quality and openness of data, interoperability and increased value to users. These may include standards/frameworks in the following areas:

- 3D for holistic documentation, knowledge representation and digital reconstruction;
- The structure, content and format of documentation to ensure the integration, enrichment, retrieval and reuse of XR content;
- Standards for digital reconstruction of CH;
- Linked Open Data (LOD) to transform cultural heritage collections;
- DCH data and metadata standards to ensure interoperability and interconnection with geo-spatial, bibliographic and archival metadata;
- Interoperability of data sets created by different stakeholders associated with cultural heritage data, such as those held in laboratories in universities, libraries and museums.

Further points raised by the experts included:

- The need for a feasibility study on the creation of the Competence Centre.
- The need for a business model to be developed following after for long term sustainability for the Competence Centre with the goal of ensuring the financial independence of the Centre itself. The options identified included: philanthropic funding, revenue from high quality accredited professional course, a premium service charging model, subscriptions and others.
- The legal entity of the Competence Centre.
- That the Professional Integrity and Independence of the Centre is protected and guaranteed all along; for example, by establishing a Board.

III Human Resources, education and training

Keeping up with the changing socio-economic climate and pace of technological advances requires long-term investment in maintenance and development of skills, expertise and collaborative relationships.

An expert study *A new European landscape for heritage professions*¹⁹ and the *European Initiative 8: Heritage Related Skills*, launched by the European Commission under the "Work Plan for Culture 2015-2018" provide recommendations and good practice case studies on heritage skills, training and knowledge, directed at the critical stakeholders: policymakers, education and training institutions, cultural institutions and professional representative associations.

Its key messages are that: *While European expertise in heritage preservation and conservation is renowned, the combined effect of the age pyramid, cuts in public budgets, the digital shift and academisation of society are affecting the wider transmission of knowledge and skills. This happens at a time when new skills and competences are needed, to progress towards more integrated and participatory management of cultural heritage, and better use of the opportunities offered by the new technologies to preserve heritage and enhance the visitor experience and public engagement in heritage sites and museums. It is urgent for Europe to consider how best to enhance, promote and protect the traditional, technical and professional skills of the people who ensure the long-term sustainability of Europe's cultural heritage.*

The summary recommendations aim at maximising the benefits and value to be gained by Europe due to improving the cultural heritage professions' skills, training and knowledge transfer, summarised under the four pillars of EYCH 2018: engagement, protection, sustainability and innovation, as well as the transversal dimension of international relations.

One legacy of EYCH 2018 is the *European Framework for Action on Cultural Heritage* which, under one of its four objectives – Innovation, calls for 'Heritage-related skills: better education and training for traditional and new professions.

The European Commission's Digital Education Action Plan - DEAP²⁰ (January 2018) also highlights the urgent need for education and training systems to address the digital skills gap and ensure that all citizens benefit from the opportunities of digital change. DEAP points to the importance of harnessing the potential of digital technologies to support education's core mission: to help students develop the skills, knowledge, and attitudes to thrive in a world that faces rapid technological, cultural, informational and demographic change.

Alongside this, the ET2020 DELTA Working Group²¹ takes a lifelong learning perspective and covers all sectors of education, formal, non-formal, higher education, VET, adult and work-

¹⁹ https://europa.eu/cultural-heritage/toolkits/new-european-landscape-heritage-professions_en

²⁰ https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en

²¹

<http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=3407&NewSearch=1&NewSearch=1>

based learning, considering digital education as an integral component of teaching and learning defines the key priorities as being.

- Making better use of digital technology for teaching, learning and assessment;
- Developing relevant digital competences and skills;
- Improving education through better data analysis and foresight.

Other initiatives such as the report from Germany *Towards an integrated approach to cultural heritage for Europe – prospects on skills, training and knowledge transfer for traditional and emerging professions* have led to the Heritage-Pro project *Interdisciplinary Training for Professionals of Different Disciplines Towards Sustainable Management and Preservation of Cultural Heritage*²² which provide further analysis and definition.

CHI that are ready to take on innovation challenges will be able to create a stronger socioeconomic impact across the sector. A **consolidated and high impact initiative in education and training for DCH specifically** is therefore needed to underpin the success of developments by ensuring the availability of sufficient capacity of skilled human resources at all levels of activity.

In moving toward an overall framework for DCH education and training in Europe, the programmes of DG EAC (Erasmus+, Creative Europe) should provide an essential basis, assuming that they include and enable the following:

General

- sectoral training needs studies, addressing the question ‘who needs to be trained, for what purpose and at what level’ with the aim of developing programme recommendations.
- creating and repurposing DCH-related material as educational e-resources for every level, including guidelines, tutorials, webinars, videos and games.

Vocational and professional

- Development and implementation of European DCH training activities, accompanied by meaningful certification to stimulate a continuous improvement of skills and competences of professionals working in and for CH institutions or independently.
- Practical hands-on training programmes and collaborative workshops that focus on interoperable standards and emerging technological solutions will help develop a skilled and confident workforce across the sector that is needed to drive the innovation and research forward, on a transdisciplinary and trans-sectoral basis.

²² www.heritage-pro.eu

- Incentivising communication activities to share knowledge for curators, administration and governance staff such as conferences, workshops and online media to raise the level of understanding of the potential of digital methods to advance the work of CHI and to support participation and collaboration with the general public.
- Creation of EU funded incubators/accelerators where CH organisations can send their people to be upskilled for 1-2 intensive months of training; also, investing in hardware and software to be used by the incubator/accelerator's participants;
- Use of Online tutorials, with chat rooms, to give professionals the opportunity to upskill in their own time.

Technical

- Stimulating continuous adaptation of the curricula of higher and further education institutions conducting technical education to meet the requirements of the DCH sector.
- Programmes of technology workshops and cultural heritage hackathons.

Academic research

- Concerted efforts to promote the introduction of Masters and PhD qualifications relevant to the advancement of DCH such as those currently envisaged under the new European Research Chair in Digital Heritage at Cyprus University of Technology.

Schools

- Increasing knowledge of practices regarding the implementation of digital technology and the use of DCH in education, possibly to be monitored as part of a future instance of the '*Survey of Schools: ICT in Education*'.
- Encouraging adaptation of school syllabi to help students to acquire awareness in knowledge and competences about subjects such as Artificial Intelligence and cloud computing and their applicability in creating and (re-)using DCH.
- Game competitions and awards (e.g. on the eSports model).

IV Policy and international cooperation

This aspect of the Action Plan was presented and discussed but not subject to detailed expert validation in Vienna, since it is the main focus of the meeting of international organisations to be held in Paris on 15 March and will be reported in D7.4.

Positioning the DCH sector is a broad topic that covers several strategic, legal, conceptual and financial issues relevant to VM/DCH. Synergies between EU policies and the strategies for DCH of key international organisations in the CH field (such as UNESCO) should be developed through closer collaboration and coordination by all institutional actors regarding

their programming policies in order to develop a stronger sector, coordination and the promotion of funding for DCH and committing to mutually reinforcing planned activities in areas of major need. EU and international agencies should work in alliance to create favourable policies and conditions for the global exploitation of the vast economic, social and environmental potential of DCH

A package of measures to promote cultural heritage and keep it higher on the political agenda was announced by the European Commission at the end of EYCH2018 and included *Cultural heritage for stronger global partnerships: strengthening the international cooperation In the framework of Horizon 2020*. This involves the EU in setting up an international network for innovation and diplomacy in the Cultural Heritage area where Third countries will benefit from EU expertise, such as training to protect cultural heritage or to promote innovative, tailor-made solutions in different regions (EU Neighborhood countries, Latin America, Africa, Asia). This approach should incorporate DCH.

The following are among those which can be identified as areas for international policy agreement and collaborative action on DCH .

Paradigm shift

Profound changes, such as the digital transformation of our society, can be conceived both as threats and opportunities. The role of digital initiatives in supporting rather than threatening 'physical heritage' should be widely understood and the relationship between 'virtual and digital heritage' and 'real heritage' (tangible or intangible) strengthened rather than dissociated. Interest has likewise moved far beyond the traditional boundaries of the 'monument and museum case' to embrace intangible heritage and cultural and natural landscapes and ecosystems.

Cultural heritage is now widely appreciated as an essential part of Europe's underlying socioeconomic, cultural and natural capital. In *Getting Cultural Heritage to Work for Europe Report of the Horizon 2020 Expert Group on Cultural Heritage*²³ it is argued that the European Union should vigorously promote the innovative use of cultural heritage for economic growth and jobs, social cohesion and environmental sustainability. Cultural heritage must be seen as a special, but integral, component in the production of European GDP and innovation, its growth process, competitiveness and in the welfare of European society. Like environmental protection, it should be mainstreamed into policy and regarded as a production factor in economic and wider policy development.

For maximum effect policies should be adapted by governments and managements of CHI, along the lines defined by Pier Luigi Sacco, moving from culture being a cost-intensive

²³ https://ec.europa.eu/culture/news/2015/0427-heritage-2020_en



resource of public patronage to a value adding relationship between culture and economies which can substantially strengthen competitiveness. For example, heritage-led urban regenerations spread knowledge, experience and good practice to help municipal leaders develop the vision, and gain the skills, to be successful at using heritage to regenerate their towns, using their cultural heritage as a powerful economic, social and environmental catalyst for regeneration with a strong link through ICT to the concept of Smart Cities. Similarly, culture and biodiversity can be integrated and enhanced to create successful living rural landscapes

Understanding the shift of paradigm also entails seeing the role CH in a broader context as a powerful asset that can help foster the sense of belonging and cohesion for all citizens which should represent all individuals and groups regardless of socioeconomic, demographic or geographic boundaries and a source for advancing inclusive, innovative and reflective societies.

The use of cultural heritage and, increasingly, its digital representation to reflect on past and present social challenges and a deeper understanding of complex and current issues will be crucial in shaping the identity of societies. XR applications potentially provide a powerful potential to deal with different aspects of this contextualization in the form of immersive environments, augmented reality, storytelling etc.

Co-ordination and expansion of investment

The future implementation of the proposed measures and actions within the DCH sector will continue to require extensive financing. Budgets are required to enable museums and stakeholders to invest the needed resources in hardware and software solutions as well as in training staff and supporting infrastructure.

The ViMM community identifies a lack of resources and also great imbalances between institutions in relation to their scale, legal statutes, location, and content. This need, however, remains largely unquantified and that further demand analysis is needed at institutional, regional, national and European and international level to ascertain its extent.

Whilst a number of innovative, creative and experimental approaches have been taken to releasing the locked-up potential of Europe's heritage, it is necessary to develop new funding frameworks by creating the legal conditions. Collective investments on an EU-wide scale are likely to be needed in new technologies, since few if any individual institutions can make them on their own. Rethinking current business models and discovering new routes for financing and exploring potential revenue avenues is likely to play a large role in the coming years.

The following are among the broad priorities to be addressed:

- Continuation and expansion of long-term funding at EU and national level, to maintain and increase the impact of existing infrastructures such as Europeana or to convert temporarily-funded projects into sustainable institutions.
- Developing new funding frameworks at EU and national level by creating legal and administrative conditions supporting incentivisation of funding from different sources, such: as direct public subsidies, tax incentives for private funding and philanthropy, crowdfunding and reducing existing barriers for multi-institutional, collective funding and investments by building new partnerships outside the CH sector,
- Measures to increase financial support for small and medium-sized CHI, enabling implementation and operation of new tools and technologies as well as training of staff.
- Sustainable solutions which not only improve cost efficiency, but also reduce the gap between investments in implementation of digital projects supported for a limited time and longer-term ‘backbone’ or infrastructural actions.

Considering the complexity of the large number of simultaneously active funding programmes and policies of organisations on different levels it is necessary to investigate further international synergies and coordination in order to advance technological innovation and secure sustainability.

Values and mutual understanding

- Inter-sectoral understanding should be actively constructed, to foster trust between professionals in fields such as tourism, planning, conservation and ICT, through coordination activities like international seminars to establish mutual understanding of legitimate objectives and common terminologies for DCH.
- An ethical framework of ‘virtual values’ (such as that outlined in the ViMM Manifesto) is needed to underpin DCH strategies and development, and to provide CHI personnel with a comprehensible direction for their approach to digital content.

Intellectual Property Rights

Existing frameworks should be built upon to establish international frameworks for rights to manage intellectual property and copyright issues related to the accessibility and reusability of DCH which, among other things:

- Promote clear licensing: ensuring that content and software are available under clearly stated licenses so that everyone who wants to re-use certain information can address the rights owners.
- Strengthen and raise awareness of open access licensing policies for digital data, support CHI in adopting Open Access policies and frameworks for digital data and address remaining reluctance to adopt such concepts.



- Promote the use of open software tools through funding and advocacy programmes.
- Adapt approaches to IPR in the light of shifts of cultural, economic and technical paradigms and the role of cultural heritage in a broader context.

Promoting standardisation

- Standards in digitisation to ensure improved quality of data, interoperability and openness can play a key role in making the sector more financially attractive.
- Further joint development of existing open formats and standards should be promoted by international bodies such as ICOM, UNESCO, and the European Commission, alongside development of currently missing standards, involving technology producers in this process.
- Expanding the usefulness of DCH to wider audiences by agreeing and promoting methodologies and standards for more holistic documentation, leading to advanced knowledge creation and 'storytelling'.



Indicative Action Plan timetable

	I. RESEARCH AND INNOVATION UNDER HORIZON EUROPE	II. DIGITAL CULTURAL HERITAGE COMPETENCE CENTRE NETWORK	III. HUMAN RESOURCES, EDUCATION, TRAINING	IV. POLICY AND INTERNATIONAL COOPERATION
2019				ViMM international coordination event (February), establishes areas of cooperation
2020		Conception and establishment	Framework created for DCH education and training	International agreements agreed
2021	Topic 1 Harnessing and combining key technologies Topic 3 Smart, contextualised experiences in DCH	Implementation	DG EAC programmes established for DCH	International actions and monitoring
2022	Topic 4 Sustainable Infrastructure for Digital Transformation of CHI Topic 5 Holistic documentation of 3D Heritage	(cont.)	Implementation	(cont.)
2023	Topic 6 Preserving and exploiting born digital cultural assets Topic 2 Deploying technologies to engage wider audiences for DCH	(cont.)	(cont.)	(cont.)
2024	Topic 7 Full accessibility of DCH through socially inclusive technology	(cont.)	(cont.)	(cont.)
2025		Consolidated evaluation and impact assessment of competence centre network		(cont.)
2026				(cont.)
2027	Consolidated evaluation of DCH research and innovation projects		Consolidate evaluation of education and training initiatives for DCH	(cont.)



CONFIDENTIAL ANNEX – DRAFT RESEARCH CALL TEXTS SUBMITTED TO THE COMMISSION