



ViMM Virtual Multi-Modal Museum

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1 EXECUTIVE SUMMARY

This document reports on the process leading to and results emerging from the joint Consensus event of all 7 ViMM Thematic Areas (Definitions-Directions-Documentation-Dimensions-Demand- Discovery- Decisions), held in Berlin on 12 and 13 April,2018 in which about 100 invited experts in Digital Cultural Heritage participated. It represents the culmination of the stage in the work of ViMM arising from its 21 Working Groups (three per Thematic Area), which took place between Months 6 and 15 (March-December 2017), the immediate results of which are reported in D3.2 *Seven TA Working Group Composite Reports*.

The Draft Propositions prepared by the TA Leaders were discussed and refined by each TA Group in Berlin and the resulting versions (provided at section 4.1) were taken forward to the Plenary session on Day 2, where each of them was presented (or ‘pitched’) to the participants by a nominated expert. As the culmination of the event, an advisory online ‘polling’ exercise was conducted using the Slido¹ software, the results of which form section 4.2 of this document.

Following the Berlin event, the 48 Propositions emerging were synthesised into 9 areas by CUT in consultation with the project partners, in order to move towards a coherent whole statement based on the consensus emerging to address, as far as possible, any overlaps, duplications or conflicts . This synthesis of Propositions forms section 4.3 of this Deliverable.

As a result of this process, the Thematic Area structure (the ‘7Ds’) created by ViMM in order to gather evidence and ideas and to generate expert discussion is now being transformed into a more holistic approach towards the spectrum of Digital Cultural Heritage (DCH),

The stages following this work lead on to the production of the ViMM Manifesto, Roadmap and Action Plan, which are the subjects of subsequent Deliverables and which will likewise benefit from wide consultation and the provision of further supporting evidence.

¹ https://www.sli.do/features-questions?utm_source=google&utm_medium=cpc

2 INTRODUCTION

This document reports on the process leading to and results emerging from the joint Consensus event of all 7 ViMM thematic Areas (Definitions-Directions-Documentation-Dimensions-Demand- Discovery- Decisions), held in Berlin on 12 and 13 April, 2018 in which about 100 invited experts in Digital Cultural Heritage participated. It represents the culmination of the stage in the work of ViMM arising from its 21 Working Groups (three per Thematic Area), which took place between Months 6 and 15 (March-December 2017), the immediate results of which are reported in D3.2 *Seven TA Working Group Composite Reports*.

Following the completion of D3.2, each TA Leader was requested to derive up to 6 Key 'Propositions' from the results of its Working Groups, consulting selected experts from their Working Groups and seeking further external advice where appropriate. These draft Propositions were circulated to the participants invited to Berlin and were the subject matter of discussions at the individual TA meetings held on Day 1 in Berlin.

Each TA Leader was invited to nominate three members of each WG to participate in Berlin, representing a balance of expertise and including, where possible, each WG Chair. In addition, identified external experts were invited, in order to bring in new perspectives. The list of participants registered for each TA consensus workshop on Day 1 in Berlin, is provided at Annex 1. In all, some 94 experts participated on this day. Project partners, facilitators and invited guests brought the number of those involved to about 123.

The draft Propositions were discussed and refined by each TA Group in Berlin and the resulting versions (provided at section 4.1) were taken forward to the Plenary session on Day 2, where each of them was presented (or 'pitched') to the participants by a nominated expert. As the culmination of the event, an advisory online 'polling' exercise was conducted using the Slido² software, the results of which form section 4.2 of this document.

Following the Berlin event, the 48 Propositions emerging were synthesised into 10 areas by CUT in consultation with the project partners, in order to move towards a coherent whole statement based on the consensus emerging and to address, as far as possible, any overlaps, duplications or conflicts. This synthesis of Propositions forms section 4.3 of this Deliverable.

The stages following this work lead on to the production of the ViMM Manifesto, Roadmap and Action Plan, which are the subjects of subsequent Deliverables and which will likewise benefit from wide consultation and the provision of further supporting evidence.

As a result of this process, the Thematic Area structure (the '7Ds') created by ViMM in order to gather evidence and ideas and to generate expert discussion is now being transformed into a more holistic approach towards the spectrum of Digital Cultural Heritage (DCH), aligning

² https://www.sli.do/features-questions?utm_source=google&utm_medium=cpc

with the process and expectations set out in section 3.1 of ViMM's contracted Description of Activities.

2.1 ROLE OF THIS REPORT IN THE PROJECT

As stated in the DoA:

During the final year of the Action, each Thematic Area will organize a consensus-building workshop at which key stakeholders are invited to make proposals for widespread adoption or implementation among the VM community'.

A result of these events will be the development of a Manifesto, Action Plan and Roadmap for VM for the following 5-year period upon which discussion and consultation will take place, including by use of the communication platform. This Plan will include proposals for sustaining both the ViMM community and its platform;

A final 2-day international conference will draw together the findings of the whole Action and seek the endorsement and support of international bodies involved in VM.

This process remains at the heart of ViMM's goals and towards ViMM Manifesto, Roadmap and Action Plan, which are the key intellectual outputs of its work. This Deliverable provides a detailed insight into the way in which these outputs have been formulated and summarises their content. As such it constitutes an important reference point for assessment of the way in which the major products will be developed and formulated and provides a collaborative baseline for these next important stages.

2.2 STRUCTURE AND APPROACH OF THE DOCUMENT

The Document consists of introductory sections outlining the objectives and process of the work undertaken.

Section 4 then presents:

- The 48 revised Propositions emerging from Day 1 of the Berlin event, which were presented to and voted on during the Plenary session on Day 2.
- The results of the polling exercise held on Day 2.
- The Synthesis of Propositions carried out in the weeks following the meeting.

The Deliverable concludes with a summary of the next steps in ViMM's work, which build on these findings.

3 OBJECTIVES OF WORK PACKAGE 7 AND DELIVERABLE 7.1

WP 7 *Consensus, road mapping and sustained visibility* and taking place between Months 20 and 30 aims:

- ‘to draw together and promote the results of the ViMM Action to become a consensus-based 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’
- to agree a plan for sustaining necessary visible of actions in support of VM and for the future of the ViMM community and communications platform’.

D7.1 *Seven TA consensus building workshops* (M21) is the first Deliverable from this process and draws on Task 7.1: ‘Each Thematic Area will organize a consensus-building workshop at which invited key stakeholders are invited to make proposals for widespread adoption or implementation among the VM community. These workshops will be co-located where appropriate. Up to 120 stakeholders will be invited to them in total. Completed by Month 21’.

4 RESULTS

4.1 PROPOSITIONS FOLLOWING THE BERLIN CONSENSUS WORKSHOP

TA 1 Definitions

1.1 Positioning the sector

Culture is becoming increasingly a precondition of all kinds of economic value generation processes' driven by two concurrent streams of innovation: digital content production and digital connectivity. Virtual museums, as defined in ViMM, and Digital Cultural Heritage (DCH) in general should be positioned and described to benefit from well-structured investment at the EU, national and regional level. This is critical to the economy and society in a growing context of the next FWP, where open digital platforms and social media play vital roles.

1.2 Conceptualising the VM sector: typologies, schematics & visualisation

The conceptualization of virtual museums, as introduced by ViMM, should be further developed to generate relevant policies, inspire novel implementations and to stimulate the investment of decision-making processes.

1.3 Holistic documentation

Linked (Open) Data performs a critical role in transforming cultural heritage collections. Therefore, quality standards, have to be prioritized in order to achieve an excellent level of integration, enrichment, retrieval and reuse of content. Management of cultural information is challenged by issues such as knowledge representation and information integration from different contexts. There is a need to establish expert-driven holistic and user-oriented documentation of DCH, to be carried out and funded in order to increase the scientific, economic and social potential of advanced services to users.

1.4 Digital replicas

Standards need to be agreed so that digitised content (tangible and intangible) and the related metadata becomes accessible in the long term to all through seamless access. Metadata may include access to complementary material such as images, books, descriptions and drawings, illustrating the cultural and historic significance of the sites/artefacts.

1.5 Emerging frameworks and standards

Emerging frameworks and standards which support create and share open interoperable Frameworks such as (IIIF) and Copernicus for Cultural Heritage and others, should be promoted and fast- tracked.

1.6 Content and documentation in Europeana

Europeana should extend its audience where possible by increasing the amount and quality of 3D and AR/VR/MR content it provides access to and by promoting and incorporating more holistic documentation driven by user needs.

1.7 Cooperation with international organisations

Synergies between EU policies and strategies for DCH and those of key international organisations and leading players in the CH field should be leveraged for maximum global advantage.

TA 2 Directions

2.1 Policy and society

Why?

Society becomes technology driven: CH organisations should adapt, get involved

Culture is an economical asset (Culture 3.0): Policies must be developed and put into practice in order to gain maximum effect.

Ethics

Governments should monitor the development of the Digital environment. Not by enforcing or blocking information streams (the easy option). DCH information must move top down and bottom up.

DCH should not exclude groups, minorities; besides “high tech” developments “low tech” should be developed and maintained simultaneously.

Anybody involved in CH should reflect on essence and consequences of digitisation and digital virtual reality and its implications for misuse and manipulation for political reasons.

Pragmatic/logistical

Clear and tangible policies for governments and CHI management.

Anybody involved in handling, exploitation, research and valorisation should be aware of the usefulness of VR/MR/AR technology that can support their processes, both internal and external. > Should be part of educational curriculum in CH.

2.2 Organizational change

- Open minded mentality
- Focus on inclusive technologies
- Accessibility, sustainability, interoperability
- Possibly a Department / Committee for this?
- Project-based ‘Organisational Readiness Value’

Institutions are not working in a vacuum but should ensure openness to the outside world. For them to be able to make the most of new technology there needs to be organisational change. It is important for museums to develop a strategy for inclusive technologies and invest the needed resources in hardware and software solutions as well as training and support. Here accessibility, sustainability and interoperability should be prioritised.

For organizational change to happen the organisations should ensure that internal communication is taking place as a network/strategy initiative both within their own institution and in cooperation with other national/international institutions.

Openness

- working with 3rd parties
- partnerships, crowdfunding, crowdsourcing (etc.)
- to present yourself to your audiences
- both content and software should be under free licenses (open source) to ensure that other can use it

Openness to the outside world would strengthen the institution's ability to support new technologies and is crucial for the virtual museums to become a reality. The Digital Cultural Heritage field should look to the outside world, with a logic of abundance rather than scarcity.

For virtual museums to work, openness to partnerships needs to be a part of it. Museums should be open-minded and work together and support a variety of production houses, creative businesses, SMEs, etc. for multiple purposes, providing virtual products to promote cultural heritage beyond the limitations of a physical museum. For this both content and software should be under free licenses (open source) to ensure that others can easily (re-)use it. This creates potential for commercial derivation.

Working in an open way will ensure better possibilities for fundraising as value is shown. This also increases the possibility to get the general public involved in crowdsourcing which can create new possibilities, increase engagement and create other benefits for the institution.

Thinking long term

- Innovation
- Investments
- Strategies for Digital Development
- Free licenses (open source) will ensure that when a company goes away the content is still accessible and ensure that it is available long term

Cultural heritage organisations should be aware of the usefulness of VR/MR/AR technology that can support their processes, both internal (content and asset management, preservation, restoration) and external (promotion and marketing, access to archives and unexposed artefacts, new experiences of CH, linking up collections for educational, scientific and/or commercial purposes etc.). These represent considerable innovation opportunities, which can be enhanced by placing an emphasis on education and communication.

In terms of investments, there are multiple levels. It is important for museums to provide additional resourcing and staffing across digital, IT, design, and content creation/editing roles.

2.3 (Organisational): Digital transformation

Organisations should have a view towards producing digital experiences as universal as possible. The vision for technology take-up should be mapped to the overall vision and benefits of the museum's mission not to miss out on opportunities. This will help organisations stay innovative, which is a necessity also for fundraising.

Managements should prioritize digital transformation and lead organizational change to cooperate in a shared digitisation process within a common general strategy which tackles interoperability problem and creates "economies of scale". The institutions need to work proactively and prepare material for reuse. It needs to create and uphold plans for workable frameworks for how to work with its material, such as investigating image rights and strengthening the ability of museums to support new technology. Also, it is important to consider the use of open source software tools and formats as a first priority in order to ensure long term usability of the material created (and not lost if a company goes out of business or a format gets dismissed).

2.4 (Technical): Digital Transformation

EU should promote and fund technology that can help create Virtual Cultural Heritage, for instance the process of digitising collections and objects and infrastructural upgrades in and for museums. For achieving sustainability, all digital cultural information should be based on open formats, meeting meta data standards and support long-term availability. Required updates have to be taken in to account and funded. We strongly recommend that museums make their data available by open licence.

2.5 Digital Transformation: content delivery & maintenance

It is common knowledge that technology (hard and software) needs to be updated periodically, which unfortunately not all museums have embraced or even understand. It is also common knowledge that visitors/people own devices.

Museums should make maximum use of the hardware technologies already owned by people.

Adoption

Museum departments should incorporate technology solutions within their day-to-day responsibilities and should commit to regular updates of the content which visitors experience through websites, online collections, education resources and mobile apps

2.6 Virtual values

Act as a framework for virtual/augmented/mixed experience strategies and development, and at the same time provide museum-staff with a comprehensible direction for the museum's approach to virtual and augmented content.

The Virtual Values identified by ViMM include:

- "Virtual for all" Rule
- Layered Content
- Accessibility
- Sustainability
- Complementarity

TA 3 Documentation

3.1 Technology watch (with use cases and examples)

It is important that cultural heritage institutions are aware of and informed about technologies available to support their documentation requirements. To enable cultural heritage institutions to choose a technology that fits their needs an inventory of innovations accompanied by examples and use cases should be established and maintained. A thorough investigation of the applicability of technologies used in other sectors (e.g. industries or universities) should be conducted and shared, and an on-going process of technology watch initiated. To this end, the technologies should be documented as well as the entities that were created using them (whether they succeeded or failed). To support such a technology, watch a set of metadata and standards for the description of each example or use case should be defined.

This is a meta-topic potentially involving more than documentation only. This could lead in the long term to a permanent service.

3.2 Supporting contextualisation of virtual objects

Everyone involved in creating virtual objects should ensure that information to support contextualisation (e.g. temporal or spatial coverage, uses of the analogue original) always accompany their products. Standards and methods (e.g. linked data) should be followed if available and other cases for providing sufficient metadata to support different contextualisation scenarios (e.g. static environment, augmented reality) should be addressed.

Many 3D models created in the past (e.g. available at Sketchfab and other channels) have limited applicability due to a lack of associated metadata. In particular, this can make it difficult to present cultural heritage objects in the context necessary to understand their meaning and relevance or to draw scientific conclusions from them. Universities and schools conducting technical education should teach the relevance of cultural background information for the understanding of cultural heritage objects. Projects digitizing cultural heritage should emphasize the historical and cultural background of what they are presenting. (Example provided in 3.3).

(Might be harmonized with 1.3 “Holistic documentation” and 6.4 “Tangible heritage into digital context: integrated view”).

3.3 Story-telling as an example of contextualization

New technologies e.g. 3-D, VR, AR, MR offer new opportunities to engage, to teach, to involve and will be an important part of digital/virtual exhibitions to transmit both tangible and intangible cultural heritage. Methods of visualization based on new technologies need to be exploited. Scenarios, test cases and easy-to-use instruments need to be developed to support the integration of new technologies in digital exhibitions and other story-telling applications. The documentation requirements to support this kind of contextualisation, and in particular the needs of documenting intangible heritage, need to be understood and made available as best practices (See 3.2).

3.4 Faithful representations

Often 3D-objects presume to present and replace a cultural heritage object. Many, especially older, cultural heritage objects are only partially preserved. The missing parts are then

reconstructed while building 3D-objects, whether by “physical parts”, colouring or the extent of some pieces etc. Every 3D-object that contains such “reconstructed” parts should identify these parts. For scientific purposes each reconstructed part needs to be not only identifiable, but also documented as to how the reconstruction was conducted and why the part has the actual dimensions, the actual colour etc. This holds true especially when elements of intangible heritage are incorporated into virtual reconstructions. Projects, programs and university curricula should reflect such distinctions. Research is needed on how to present the fiction/science distinction in virtual models.

3.5 (Mass-) Automated Information Extraction

Cultural heritage institutions often deal with a very large number of three dimensional objects, e.g. archaeological museums with millions of pieces, making it impossible to document each single fragment manually. More investigation and practical development of technologies for automated information extraction on a large scale is needed, underpinned by comparative analysis of different technologies as a prelude to further development. Artificial intelligence might be an enabling technology for this, especially as more data becomes available.

3.6 Participatory approaches in virtual museums

A thorough investigation of possible ways of involving citizens in documenting digital cultural heritage is needed. It is important that citizens are not restricted to being just consumers of digital cultural heritage, but that they should be enabled to participate actively and empowered to take ownership of their cultural assets. Through citizens’ involvement they can contribute knowledge which is very relevant for scholarly investigation of the respective objects, while strengthening their cultural identity. The involvement of citizens will also enable them to understand the distinction between fictional, entertainment-driven and science-based applications of 3D-digitization. Basic training and rules of thumbs should be produced to support collaboration between institutions and citizens following best practice.

TA 4 Dimensions

4.1 Immersive storytelling

MR/VR/AR edutainment (learning through story, play and interaction) in cultural heritage storytelling experiences is a key objective. However, as the rules and structures of traditional storytelling (literature, cinema, etc.) do not translate to AR/VR/MR storytelling, there is an urgent need to promote experimentation, research and interdisciplinary collaborations to create these structures for immersive and compelling stories.

4.2 Gamification

Gamification is a feedback loop that incentivizes the user to progress in the experience or learning process. To sharpen the good and efficient use of gamification elements, further research efforts to map which gamification techniques achieve which emotional result should be encouraged. Care should be taken to use gamification elements judiciously so as not to overpower the story or learning objective.

4.3 Presence

Presence can be defined as a psychological perception of being Immersed in the VR/AR/MR environment. Presence is essential for engagement and cognitive connection to the content. Presence can be enhanced if the content is relevant and coherent in terms of social and cultural factors. There should be cross-disciplinary synergies about presence-related methodologies that were not developed for, but which can be integrated, in a virtual museum of the future.

4.4 Accessibility

EU should promote public availability of authoring tools and Cultural Heritage assets and best practices to facilitate content creation (open-source). A central infrastructure should be created for re-usable 3D European digital-born assets and also setting common cross-border standards for their IP protection. EU should define a central copyright rules – framework and authenticity stamp for Cultural Heritage assets and its metadata.

Authoring tools: Software tools that helps assemble and orchestrate content elements to design a good experience (3D modelling tools, animation tools, storytelling, multimedia editing, game engines, storyboarding, data acquisition).

Authenticity stamp: Authorized and legitimate digital reproduction and use of DCH assets.

4.5 Digital Privacy

Any data acquired on users during the VR/AR/MR experience must be securely processed and anonymized since now cameras, motion sensors and controllers in such applications may invade privacy. Within multiuser environments safety guidelines should be implemented to protect individual users.

4.6 Support innovation

The EU and other international heritage organizations should co-ordinate, fund and promote both incremental as well as innovative AR/VR/MR techniques for museums and cultural heritage institutions. These techniques should not only extend existing formats, (e.g. augmented audio-guides and automated educational programs) but also explore new ways of presenting cultural content. They should not compete with but extend institutional capabilities, beyond the limitations of material reality, as they relate to exhibits, infrastructure and users.

TA 5 Demand

5.1 Audience-oriented strategies

In order to better serve our audiences and to maximize efficiency of economic and social efforts, we need to: 1) map social needs and goals; 2) shift towards participatory design strategies; 3) move from technology-oriented to user-oriented perspective; 4) consider innovation also as the novel use of existing technology and not only the creation of new technology.

By focusing in interaction and conceptual design, virtual multimodal museums will be able to offer diversified, collaborative, and tailored experiences that adapt to the different needs of both audiences and stakeholders.

5.2 Education and training policies for CH professionals

A major challenge is education and training for CH professionals. In this case, policies should address: 1) active, systematic involvement and training of teachers, curators, administration and governance staff; 2) development of new and existing methodologies to promote understanding of different media paradigms; 3) ensure continuous training through DUI (Doing, using and interacting) and DWO (Doing with others) methodologies.

By doing all this we will enhance awareness of and openness to digital initiatives, as well as promote innovation in Education.

5.3 Governance and decision-making

An important gap can be identified between investments in implementation of digital projects and 'backbone' actions. In order to improve cost/impact efficiency and achieve greater sustainability effective operational and business planning is needed. Requirements include a well-structured decision-making process, measurement and evaluation processes, and resources allocation for studies. Key actions are:

Establishment of standardized processes for the four stages of any digital heritage project: conception, design/planning, implementation, and operation.

Organization of the administration and governance structures, by developing extensive support schemes for an effective decision-making process, both internal (digital project owners and promoters) and external (policy makers, administration, communities).

Development of new channels to present/propose projects in CH institutions, which will lead to new governance structures.

5.4 Incentivising funding

While there is a solid demand for virtual multimodal museums, there are lacks resources and also great imbalances between institutions due to, amongst others, the scale, legal statutes, location, and content type. In order to address these imbalances, policies for the incentivization of funding from both public and private sources need to be developed: direct public subsidies, tax incentives for private funding, sponsor visibility, fundraising initiatives, crowdfunding.

It is important that:

Funding be not technology-driven but rather project-driven.

Resources are allocated to the first two stages of the four-stage decision-making process (concept and design/planning).

5.5 Community ownership

A sustainable future for Digital Cultural Heritage will benefit greatly from a wide sense of ownership by and involvement of the communities concerned, such as neighbours, local communities, physical visitors, and virtual visitors. As DCH initiatives apply global strategies, they should take steps to increase the social and economic benefits for these communities, such as schools' involvement, minorities inclusion, accessibility, local enterprises and product promotion, open content.

5.6 Assessment and impact

In order to improve efficiency and effectiveness of the use of resources, assessment and impact studies, as well as standardized processes, should be included as a fundamental commitment of CH institutions and as part of all projects funded and/or carried out by public and private institutions. The available methods and tools to address these needs are not sufficiently mature and developed neither for project assessment nor for impact evaluation. Correspondingly, funding should be allocated specifically for research and development of toolkits, case studies, and general frameworks.

Important aspects are:

Process development for qualitative and quantitative measurements of the impact of digital culture on specific economic and societal issues, as well as economic return on investment to cultural organizations.

Assessment of the project against its own original objectives, such as usability studies, operation, user analytics, etc.

TA 6 Discovery

6.1 Multimodal worlds (digitization)

Manifesto: Create interdisciplinary consortiums:

Interaction should be the key rule to better understand the real objects, their evolution vs. time, and ensure their long-term conservation;

Needs clearly defined and adapted to the users (either public or professionals).

Roadmap: Cultural heritage needs defined by heritage professionals:

Main focus of any new proposal;

Balanced consortium with technology experts and users, sharing all the same interest.

Manifesto: Simulation of 3D worlds should include:

Interaction with people (multilingual, including ancient languages) and other actors (such as animals);

Integration of sensory aspects such as touch, smell and sound;

Immersion will play a key role

Roadmap:

Need to define libraries of Virtual Human, gestures, emotions, 3D animals, etc.

Need to emphasize vision-based technology (real time), speech synthesis/recognition (algorithms) and immersion for the interaction.

6.2 Semantics & new Forms of Knowledge

Manifesto

New areas of creating and representing meaning in order to provide for personalised experience should be explored

Roadmap

- Proposed areas for analysis, modelling, representation and increased interaction are:
- Cultural values, recognition and significance
- Representation of Emotional intelligence
- Time/space/provenance/ uncertainty aspects in semantics
- Emotion-based user interfaces

Manifesto

Human-machine collaboration will enhance our understanding, enjoyment and performance

Roadmap

- Broadening up by interlinking metadata/data across domains (i.e. curated/scientific data, automatically extracted/sensor data, crowdsourced data, etc.)
- Capturing knowledge directly from the human brain and body activity
- New immersive environments that enhance interaction between human and machine activity
- Efficient interfaces for semantic tagging by humans

6.3 Cooperation/Standardization

Manifesto

- We need to preserve the current standards and thus sustain backward-compatibility
- We need to create more powerful and intelligent standards that can be used across domains

Roadmap

- Continuity and sustainability via interconnections between standards
- To create an open format that is interoperable in different systems and disciplines, based on ontologies.

TA 7 Decisions

7.1 Efficient workflows for Virtual Museums

Workflow efficiency from the point of view of documentation and preservation/curation of the collection:

1. Awareness of the “Digital Turn” (it’s all about data, in particular the structured and harmonized data)
2. Awareness of heterogenous data, contents and formats (3D/2D, textual, audio, video)
3. Data preparation/curation (data modelling), semantic enrichment, development of the application ontology (CIDOC CRM referenced)
4. Linked Data requirements (Linked Open Data), controlled vocabularies/authority files, contextualization of the collection (i.e. re-using geographical data/historical maps, re-using other Linked Data Resources, EUROPEANA)
5. Open Access Policies according the digital data (e.g. Creative Commons)

Infrastructure needed:

Open Source CMS (beyond solutions like “MuseumPLUS”) as platform for indexing and publication (e.g. <http://wiss-ki.eu/> or <https://omeka.org/>),

Open source frame work for object visualization/dissemination (WebGL for 3D and IIF for 2D)

Workflow efficiency from the point of view of **target-oriented dissemination of the collection**.

1. Content exploitation and information visualization (communication of huge amount of digital artefacts).
2. Definition of target groups (end consumer) and proper development of narratives and storytelling for the exhibition arising awareness of the CH, in particular the DCH
3. Enhancing the benefits of the Creative Industry and ‘nerds’ (Hackathons towards Virtual Museumthons), implementing Citizens Science and Crowdsourcing, strengthen the idea of Open Science.
4. Ensuring the usage of various applications and technologies for dissemination, e.g. VR, AR, and MR applications, Interactive/immersive applications, Imaged based (linear) storytelling (film animation)

Introduction of additional relevant technologies

- artificial intelligence
- computer vision
- deep learning / machine learning
- adaptive cognitive methods

7.2 Effective communication

Effective communication will be accomplished by creating a VR and DCH network of experts, companies and organisations, enabling them to find and interlink with one another through specialised social media. Initially, the data will be collected through the ViMM website and will later be integrated into an existing sustainable platform (e.g. LinkedIn). These profiles will include categories of skills and expertise to help users to filter and find potential partners or clients.

7.3 Understanding target audiences

There is a need for a clear classification of target audiences, who benefit from the ViMM project.

The major target audiences are:

- Technical specialists (including those of private companies) – to interconnect;
- Curators & decision makers within museum management – to know where to go to and why it is helpful;
- Partner organizations – not to duplicate the work but to share;
- Industries which use the same methods and techniques – to connect with the CH world.

The ViMM Platform will promote targeting these audiences by different means, among which publishing best practice examples and having Capacity Building days.

The general public is not a direct target group of ViMM, but rather of the resulting museums. ViMM will provide some tools to help those virtual multimodal museums understand and analyse their target audiences.

7.4 External communication policies

For virtual multimodal museums to be developed and sustained in the long-term, effective policies and means of cross-disciplinary communication are required. Using as wide range of communication channels as possible, including mass/social media and public events, a good understanding of the educational role and socio-economic impact of such museums should be fostered, in order to attract funding and encourage their creation, support and wide use. Virtual multimodal museums should set their own objectives, methods, requirements, resources and assess risks in order to achieve an effective communication strategy.

7.5 Human Resource Development and training

- Offer of training (digital workflow) adjusted to the target group involved in the CH sector
- Offering of the workflow in a breakdown format (several steps/stairs to achieve the “ViMM- certificate” (still to be done).
- Distinguish between high technological skill and decision and policy making process.



- Popularization of the workflow via ViMM platform and prepared updated Webinars (according to the innovative remote teaching methods)
- Setting up a network between the multiple working groups (digital (art-)history, virtual archaeologist, etc.)
- Ensuring the next generation of digital curators and virtual museologists by recruitment of tutors and trainees from relevant universities/institutions (e.g. digital art history master's degree studies, University Erlangen-Nurnberg, etc.)

7.6 Training in DCH

Who needs to be trained, for what purpose and at what level?

- Secondary education
- Undergraduate
- Postgraduate
- Professional/vocational
- In work (curators, IT specialists)
- Volunteers/community

ViMM supports the recent recommendations of the Council of Europe in the areas of Knowledge and Education for Cultural Heritage and proposes that the DCH sector develops them [Council of Europe Strategy 21](#)

4.2 RESULTS OF THE POLLING EXERCISE IN BERLIN

Each participant was allowed to select a maximum of ten propositions. The % figures are the proportion of the expert audience which voted for each proposition. The first table is in order of TA, the second in order of % votes received. The total number of voters was 94.

Which are the ten most important propositions for the future of DCH in Europe?

1.1 Positioning the sector	55%
1.2 Conceptualising the VM sector; Typologies, Schematics, Visualisation	17%
1.3 Holistic documentation	26%
1.4 Digital replicas	12%
1.5 Emerging frameworks and standards	15%
1.6 Content and documentation in Europeana	12%
1.7 Cooperation with international organisations	20%
2.1 Policy and society	24%
2.2 Organisational change	23%
2.3 Digital transformation (Organisational)	11%
2.4 Digital Transformation (Technical)	16%
2.5 Digital Transformation (Technical level)	11%
2.6 Virtual values	18%
3.1 Technology watch (with use cases and examples)	28%
3.2 Supporting contextualisation of virtual objects	37%
3.3 Story-telling as an example of contextualisation	40%
3.4 Faithful representations	27%
3.5 (Mass-) Automated information extraction	24%
3.6 Participatory approaches in virtual museums	29%
4.1 Immersive storytelling	37%
4.2 Gamification	20%
4.3 Presence	19%
4.4 Accessibility	21%
4.5 Digital Privacy	17%
4.6 Support innovation	26%
5.1 Audience-oriented strategies	32%
5.2 Education and training policies for CH professionals	43%
5.3 Governance and decision-making	27%
5.4 Incentivising funding	20%
5.5 Community ownership	21%
5.6 Assessment and impact	24%
6.1 Multimodal worlds (digitization)	21%
6.2 Semantics & new forms of knowledge	38%
6.3 Cooperation/Standardisation	26%
7.1 Efficient workflows for Virtual Museums	15%
7.2 Effective communication	7%
7.3 Understanding target audiences	12%
7.4 External communication policies	0%
7.5 Human resource development and training	26%
7.6 Training in DCH	36%

Sorted by %

1.1 Positioning the sector	55%
5.2 Education and training policies for CH professionals	43%
3.3 Story-telling as an example of contextualisation	40%
6.2 Semantics & new forms of knowledge	38%
3.2 Supporting contextualisation of virtual objects	37%
4.1 Immersive storytelling	37%
7.6 Training in DCH	36%
5.1 Audience-oriented strategies	32%
3.6 Participatory approaches in virtual museums	29%
3.1 Technology watch (with use cases and examples)	28%
3.4 Faithful representations	27%
5.3 Governance and decision-making	27%
1.3 Holistic documentation	26%
4.6 Support innovation	26%
6.3 Cooperation/Standardisation	26%
7.5 Human resource development and training	26%
2.1 Policy and society	24%
3.5 (Mass-) Automated information extraction	24%
5.6 Assessment and impact	24%
2.2 Organisational change	23%
4.4 Accessibility	21%
5.5 Community ownership	21%
6.1 Multimodal worlds (digitization)	21%
1.7 Cooperation with international organisations	20%
4.2 Gamification	20%
5.4 Incentivising funding	20%
4.3 Presence	19%
2.6 Virtual values	18%
1.2 Conceptualising the VM sector; Typologies, Schematics, Visualisation	17%
4.5 Digital Privacy	17%
2.4 Digital Transformation (Technical)	16%
1.5 Emerging frameworks and standards	15%
7.1 Efficient workflows for Virtual Museums	15%
1.4 Digital replicas	12%
1.6 Content and documentation in Europeana	12%
7.3 Understanding target audiences	12%
2.3 Digital transformation (Organisational)	11%
2.5 Digital Transformation (Technical level)	11%
7.2 Effective communication	7%
7.4 External communication policies	0%

4.3 SYNTHESIS OF PROPOSITIONS

1. Positioning the DCH sector

Culture and the heritage which derives from it is an economic and social asset. The ideas defined for Culture 3.0 have identified key links with innovation, welfare, sustainability, social cohesion, new entrepreneurship, soft power, local identity and the knowledge economy. Policies are needed which will put into practice initiatives which gain maximum effect, moving from public patronage to a system-wide competitiveness strategy via strategic investment.

Culture is becoming increasingly a precondition of all kinds of economic value generation processes' driven by two concurrent streams of innovation: digital content production and digital connectivity. Virtual museums, as defined in ViMM, and Digital Cultural Heritage (DCH) in general, should be positioned and described to benefit from well-structured investment at the EU, national and regional level. This is critical to Europe's economy and society in the emerging context of the next Framework Programme, where open digital platforms and social media play vital roles.

Society becomes increasingly technology driven: cultural heritage organisations must adapt and become engaged with this development. Clear and tangible policies are needed for and from governments and the management of cultural heritage institutions. Governments should monitor the development of the digital environment, but not by enforcing or blocking information streams (the easy option). DCH information should move top down and bottom up

An important gap can be identified between investments in implementation of digital projects and 'backbone' actions. In order to improve cost/impact efficiency and achieve greater sustainability, effective operational and business planning is needed. Requirements include a well-structured decision-making process, measurement and evaluation processes, and resources allocated for studies.

The conceptualization of virtual museums, as promoted by ViMM, should be further developed to generate relevant policies, inspire novel implementations and to stimulate the investment of decision-making processes.

Synergies between EU policies (such as the global challenges) and strategies for DCH and those of key international organisations and leading players in the CH field should likewise be leveraged for maximum global advantage.

. 2. Participatory Approach

It is striking that cultural participation has been identified, within the Culture 3.0 concept, as one of the most important in the hierarchy of factors affecting psychological well-being. In order to better serve its audiences and to maximize efficiency of economic and social efforts, the DCH community needs to:

- 1) map social needs and goals;
- 2) shift towards participatory design strategies;
- 3) move from technology-oriented to a user-oriented perspective; besides "high tech" developments "low tech" should be developed and maintained simultaneously.
- 4) consider innovation not only as the creation of new technology but also as the novel use of existing technology.

The target audiences of ViMM include

- Technical specialists (including those of private companies) – to interconnect;
- Curators & decision makers within museum management – to know where to go to and why it is helpful;
- Partner organizations – not to duplicate the work but to share;
- Industries which use the same methods and techniques – to connect with the CH world.

The general public is not a direct target group of ViMM, but rather of the resulting virtual museums and DCH implementations. ViMM will provide some tools to help virtual multimodal museums understand and analyse their target audiences.

However, there is a clear need to identify and classify the target audiences who benefit from DCH. A sustainable future for Digital Cultural Heritage will benefit greatly from a wide sense of ownership by and involvement of the communities concerned, such as localities, physical and virtual visitors. As DCH initiatives apply global strategies, they should take steps to increase the social and economic benefits for these communities, such as the involvement of schools, inclusion of minorities, increased accessibility and engagement of local enterprises in product promotion and open content.

A thorough investigation of possible ways of involving citizens in documenting digital cultural heritage is needed. It is important that citizens are not restricted to being just consumers of DCH, but that they should be enabled to participate actively and empowered to take ownership of their cultural assets. Through their involvement, citizens can contribute knowledge which is relevant for scholarly investigation of the respective objects, while strengthening their cultural identity. The involvement of citizens will also enable them to understand the distinction between fictional, entertainment-driven and science-based applications of 3D-digitization. Basic training and rules of thumb should be produced to support collaboration between institutions and citizens, following best practice.

3. Widespread harnessing of available technologies for DCH

By focusing on interaction and conceptual design, virtual multimodal museums will be able to offer diversified, collaborative, and tailored experiences that adapt to the different needs of both audiences and stakeholders.

Cultural heritage organisations and everyone involved in handling, exploitation, research and valorisation of DCH should be aware of the usefulness of XR (Extended Reality) technology that can support their processes, both internal (content and asset management, preservation, restoration) and external (promotion and marketing, disseminating content through interactive/immersive applications and imaged based storytelling, access to archives and unexposed artefacts, new experiences of CH, linking up collections for educational, scientific and/or commercial purposes etc.). These techniques should not only extend existing formats, (e.g. augmented audio-guides and automated educational programs) but also explore new ways of presenting cultural content. They should not compete with but extend institutional capabilities, beyond the limitations of material reality, as they relate to exhibits, infrastructure and users. They represent considerable innovation opportunities, which can be enhanced by placing an emphasis on education and communication.

The harnessing of additional technologies will have increasing relevance for museums and cultural heritage institutions, including: artificial intelligence; computer vision; deep learning / machine learning; and adaptive cognitive methods

This entails the full engagement of the cultural heritage sector in a process of Digital Transformation in which museum departments should incorporate technology solutions within their day-to-day responsibilities, commit to regular updates of the content which visitors experience through websites, online collections, education resources and mobile apps, periodically update their technology (both hard- and software) and make maximum use of the hardware devices their visitors already own.

It is equally important that cultural heritage institutions are aware of and informed about technologies available to support their documentation requirements. To enable cultural heritage institutions to choose a technology that fits their needs an inventory of innovations accompanied by examples and use cases should be established and maintained. A thorough investigation of the applicability of technologies used in other sectors (e.g. industries or universities) should be conducted and shared, and an on-going process of technology watch initiated. To this end, the technologies should be documented as well as the entities that were created using them (whether they succeeded or failed). To support such a 'technology watch' a set of metadata and standards for the description of each example or use case should be defined. This is a meta-topic which potentially goes beyond technologies for documentation only and could lead in the long term to a permanent service.

4. Providing and incentivising funding

While there is a solid demand for virtual multimodal museums and DCH in general, there is a lack of resources and also great imbalances between institutions in relation to their scale, legal statutes, location, and content. In order to address these imbalances, policies for the incentivisation of funding from both public and private sources need to be developed including a mixture of direct public subsidies, tax incentives for private funding, sponsor visibility and fundraising initiatives, including crowdfunding.

The EU and other international heritage organizations can play a key role in co-ordinating and promoting the means of funding for DCH – as well as funding key initiatives directly - as a vital ingredient in Europe's economic prosperity and social cohesion, not least through its museums and cultural heritage institutions. In undertaking this, it will be important that:

- funding is not technology-driven but rather project-driven.
- resources are allocated to the first two stages of the decision-making process, namely: concept and design/planning.

Horizon2020 projects should prioritise balanced, interdisciplinary consortia comprising technology experts and users who share the same interests, based on clearly defined user needs (public or professional).

5. Open formats

For achieving sustainability, all digital cultural information should be based on open formats, meeting metadata standards and supporting long-term availability. Required updates have to be taken in to account and funded. It is strongly to be recommended that museums make their data available by open licence.

Further support should be given to the universalisation of Open Access policies for digital data (e.g. Creative Commons), Open Source infrastructure for digital content management and Open frameworks for object visualization/ dissemination (WebGL for 3D and IIF for 2D).

The EU should promote public availability of open source authoring tools for Cultural Heritage assets (software that helps assemble and orchestrate content elements to design a good experience such as those for 3D modelling, animation, storytelling, multimedia editing, game engines, storyboarding and data acquisition).

Such an approach will enhance the benefits to Creative Industries and strengthen developments such as Citizen Science, Crowdsourcing and Open Science.

6. Data, documentation and semantics

Increased awareness and acceptance of the “Digital Turn” and the primary importance of data, especially structured and harmonised data, is central to the future of DCH, a sector where the data, contents and formats are heterogeneous (3D/2D, textual, audio, video).

Linked (Open) Data performs a critical role in transforming cultural heritage collections. Therefore, quality standards need to be prioritized in order to achieve an excellent level of integration, enrichment, retrieval and reuse of content.

Management of cultural information is challenged by issues such as knowledge representation and information integration from different contexts. There is a need to support and establish expert-driven holistic and user-oriented documentation of DCH in order to increase the scientific, economic and social potential of advanced services to users, involving data preparation/curation (data modelling), semantic enrichment and development of the application ontology.

Often 3D-objects presume to present and replace a cultural heritage object. Many, especially older, cultural heritage objects are only partially preserved. The missing parts are then reconstructed while building 3D-objects, whether by “physical parts”, colouring or the extent of some pieces etc. Every 3D-object that contains such “reconstructed” parts should identify these parts. For scientific purposes each reconstructed part needs to be not only identifiable, but also documented as to how the reconstruction was conducted and why the part has the actual dimensions, the actual colour etc. This holds true especially when elements of intangible heritage are incorporated into virtual reconstructions. Projects, programs and university curricula should reflect such distinctions. Research is needed on how to present the fiction/science distinction in virtual models.

7. Powering contextualisation

Linked Open Data requires controlled vocabularies/authority files and contextualization of the collection (e.g. by re-using geographical data/historical maps, other Linked Data Resources or Europeana etc.). Further momentum is needed to ensure that everyone involved in creating virtual objects provides information to support contextualisation (e.g. temporal or spatial coverage, uses of the analogue original) to accompany their products. Standards and methods should be followed if available and other cases for providing sufficient metadata to support different contextualisation scenarios (e.g. static environment, augmented reality) should be addressed.

Storytelling is an important example of contextualisation. New technologies e.g. 3D and XR offer new opportunities to engage, to teach, to involve and will be an important part of digital/virtual exhibitions to transmit both tangible and intangible cultural heritage. Methods of visualisation based on new technologies need to be exploited. Scenarios, test cases and easy-to-use instruments need to be developed to support the integration of new technologies in digital exhibitions and other storytelling applications. The documentation requirements to support this kind of contextualisation, and in particular the needs of documenting intangible heritage, need to be understood and made available as best practices.

Immersive storytelling through XR playful learning (learning through story, play and interaction) in cultural heritage storytelling experiences is a key objective. However, as the rules and structures of traditional storytelling (literature, cinema, etc.) do not translate to XR, there is an urgent need to promote experimentation, research and interdisciplinary collaborations to create these structures for interactive and compelling stories.

Immersion will play a key role. New areas of creating and representing meaning in order to provide for personalised experience should be explored. Proposed areas for analysis, modelling, representation and increased interaction include: cultural values, recognition and significance, representation of emotional intelligence, time/space/provenance/ uncertainty aspects in semantics and emotion-based user interfaces.

Simulation of 3D worlds should include: interaction with people (multilingual, including ancient languages) and other actors (such as animals); plus, integration of sensory aspects such as touch, smell and sound. For this, there is a need to define libraries of Virtual Human, gestures, emotions, 3D animals, etc. and to place an emphasis on vision-based technology (real time), speech synthesis/recognition (algorithms) and immersion for the interaction.

Gamification is a feedback loop that incentivises the user to progress in the experience or learning process. To sharpen the good and efficient use of gamification elements, further research efforts to map which gamification techniques achieve which emotional result should be encouraged. Care should be taken to use gamification elements judiciously so as not to overpower the story or learning objective.

Presence can be defined as a psychological perception of being Immersed in the XR environment and is essential for engagement and cognitive connection to the content. Presence can be enhanced if the content is relevant and coherent in terms of social and cultural factors. There should be cross-disciplinary synergies about presence-related methodologies that were not developed for, but which can be integrated, in a virtual museum of the future.

Many 3D models created in the past (e.g. available at Sketchfab and other channels) have limited applicability due to a lack of associated metadata. In particular, this can make it difficult to present cultural heritage objects in the context necessary to understand their meaning and relevance or to draw scientific conclusions from them. Projects digitizing cultural heritage should emphasize the historical and cultural background of what they are presenting.

Human-machine collaboration will enhance our understanding, enjoyment and performance, for example by interlinking metadata/data across domains (i.e. curated/scientific data, automatically extracted/sensor data, crowdsourced data, etc.) and capturing knowledge directly from the human brain and body activity.

This requires new immersive environments that enhance interaction between human and machine activity, together with efficient interfaces for semantic tagging by humans. Cultural

heritage institutions often deal with a very large number of three dimensional objects, e.g. archaeological museums with millions of pieces, making it impossible to document each single fragment manually. More investigation and practical development of technologies for automated information extraction on a large scale are needed, underpinned by comparative analysis of different technologies as a prelude to further development. Artificial intelligence might be an enabling technology for this, especially as more data becomes available.

Interaction should be the key rule to better understand the real objects, their evolution vs. time, and ensure their long-term conservation.

8. Frameworks and standards

Emerging open interoperable frameworks and standards which support, create and share DCH such as the International Image Interoperability Framework (IIIF) and Copernicus for Cultural Heritage and others, should be promoted and fast-tracked. However, the current standards should be preserved and continuity through backward-compatibility thus sustained.

More powerful, intelligent and interconnected standards are required that can be used across domains, creating an open format that is interoperable in different systems and disciplines, based on ontologies.

Standards need to be agreed so that digitised content (tangible and intangible) and the related metadata becomes accessible in the long term to all through seamless access. Metadata may include access to complementary material such as images, books, descriptions and drawings, illustrating the cultural and historic significance of the sites/artefacts.

A central infrastructure – like Europeana - should be designated for re-usable 3D European born-digital assets and also setting common cross-border standards for their IP protection. EU should define central copyright rules – a framework and authenticity stamp indicating: authorized, high quality and legitimate digital reproduction and use of DCH assets for Cultural Heritage assets and their metadata.

Europeana should extend its audience where possible by increasing the amount and quality of 3D and XR content produced by others that it provides access to and by promoting and incorporating more holistic documentation driven by user needs. Initially, this strategy may involve getting many organizations to produce presentation-quality surrogates in an interoperable format, that can be upgraded over time and are in the meantime compatible with the relatively few which are of research quality. Standards such as IIIF provide examples of such an incremental improvement paradigm.

9. Organisational change in the DCH sector

Cultural Heritage institutions are not working in a vacuum but should ensure openness to the outside world. For them to be able to make the most of new technology there needs to be organisational change. It is important for museums to develop a strategy for inclusive technologies and invest the needed resources in hardware and software solutions as well as training and support. Accessibility, sustainability and interoperability should be prioritised.

This involves:

- establishment of standardized processes for the four stages of any digital heritage project: conception, design/planning, implementation, and operation.

- organisation of the administrative and governance structures, by developing extensive support schemes for an effective decision-making process, both internal (digital project owners and promoters) and external (policy makers, administration, communities).
- development of new channels to present and propose projects in cultural heritage institutions, which will lead to new governance structures.
- workflow efficiency from the points of view of: documentation and preservation/curation of the collection and target-oriented dissemination of the collection
- thinking long term including sustainable lifelong training in all kinds of new technologies (see section 10 below).

For organisational change to happen, organisations should ensure that internal communication is taking place as a network/strategy initiative both within their own institution and in cooperation with other national/international institutions.

Openness to the outside world will strengthen the institution's ability to support new technologies and is crucial for the virtual museums to become a reality. The Digital Cultural Heritage field should look to the outside world, with a logic of abundance rather than scarcity.

Openness to partnerships is an important pre-requisite. Museums should be open-minded and work together and support a variety of production houses, creative businesses, SMEs, etc. for multiple purposes, providing virtual products to promote cultural heritage beyond the limitations of a physical museum. For this both content and software should be under free licenses (open source) to ensure that others can easily (re-)use it, thus creating potential for commercial derivation.

Working in an open way will ensure better possibilities for fundraising since value is transparent. This also increases the opportunity to involve the general public involved in crowdsourcing, increase engagement and create other benefits for the institution.

Multiple levels of investment are involved: it is important for museums to provide additional resourcing and staffing across digital, IT, design, and content creation/editing roles. The vision for technology take-up should be mapped to the overall vision and benefits of the museum's mission not to miss out on opportunities, entailing a regular assessment of organisational 'readiness' for DCH. This will help organisations stay innovative, which is a necessity also for fundraising.

Managements should prioritize digital transformation and lead organisational change, to cooperate in a shared digitisation process within a common general strategy which tackles the interoperability problem and creates "economies of scale". The institutions need to work proactively and prepare material for reuse, planning and creating workable frameworks for how to work with its material, such as investigating image rights and strengthening the ability of museums to support new technology. Also, it is important to consider the use of open source software tools and formats as a first priority in order to ensure long term usability of the material created (and not be lost if a company goes out of business or a format gets dismissed).

In order to improve efficiency and effectiveness of the use of resources, assessment and impact studies, as well as standardised processes, should be included as a fundamental commitment of CH institutions and as part of all projects funded and/or carried out by public and private institutions. The available methods and tools to address these needs are not sufficiently mature and developed neither for project assessment nor for impact evaluation.

Correspondingly, funding should be allocated specifically for research and development of toolkits, case studies, and general frameworks for impact assessment:

Important aspects are:

- Process development for qualitative and quantitative measurements of the impact of digital culture on specific economic and societal issues, as well as economic return on investment to cultural organizations.
- Assessment of the project against its own original objectives, such as usability studies, operation, user analytics, etc.

A framework of ‘virtual values’ is needed to underpin XR strategies and development, and to provide museum-staff with a comprehensible direction for the museum’s approach to virtual and augmented content.

The Virtual Values identified by ViMM include:

- a) “Virtual for all” Rule. Digital experiences are intuitive and simple-to-use, regardless of age. Usability should be inspired by existing paradigms and styles, providing users with a confidence when using the digital experiences.
- b) Layered Content. Digital experiences provide users with insightful, on-demand content based on their level of interest.
- c) Accessibility. Digital experiences should be accessible for all, regardless of age, ability or audience. On-site and on-line experiences should consider visual, auditory, cognitive, and physical limitations, while selected content must be multilingual for international audience.
- d) Sustainability. Digital experiences, connected with platforms and/or mobile devices, should be universal. Online experiences should be designed with a mobile-first approach, ensuring progressive enhancement across devices.
- e) Complementarity. Digital experiences should be complementary to the viewing experience and not interfere with a visitor’s observation of an object.
- f) Digital Privacy. Any data acquired on users during the XR experience must be securely processed and anonymized since now cameras, motion sensors and controllers in such applications may invade privacy. Within multiuser environments safety guidelines should be implemented to protect individual users.
- g) Anybody involved in CH should reflect on essence and consequences of digitisation and digital virtual reality and its implications for misuse and manipulation for political reasons.

10. Human Resource Development for DCH professionals

A major challenge is education and training for CH professionals. Policies should address: 1) active, systematic involvement and training of teachers, curators, administration and governance staff; 2) development of new and existing methodologies to promote understanding of different media paradigms; 3) ensuring continuous training through methodologies such as DUI (Doing, using and interacting) and DWO (Doing with others).

Anyone involved in handling, exploitation, research and valorisation should be aware of the usefulness of XR technology to support their processes, both internal and external. This should form part of educational curricula in Cultural Heritage. Universities and schools conducting technical education should teach the relevance of cultural background information for the understanding of cultural heritage objects.



Innovation in education and training for DCH will enhance awareness of and openness to digital initiatives. Training offers, accompanied by meaningful certification, should be stimulated addressed to the different target groups involved in Cultural Heritage and their position in the 'digital workflow', which itself should be broken down into different steps or stages and distinguished between technology skills, curatorial issues and decision or policy making needs.

The skills and capacities of the next generation of digital curators and virtual museologists can be assured by recruiting tutors and trainees from relevant universities/institutions in disciplines such as digital art history and virtual archaeology. The question 'who needs to be trained, for what purpose and at what level' should be directly addressed, taking into account secondary, undergraduate, postgraduate, professional/vocational, and in work training, as well as the engagement of volunteers and the public community in general. Remote learning can play an important role.

ViMM supports the recent recommendations of the Council of Europe Strategy 21 in the areas of Knowledge and Education for Cultural Heritage and proposes that the DCH sector recognises and develops them. ViMM will take steps to define and popularise the DCH workflow and decision-making processes via the ViMM platform and will continue to build working networks within DCH.

Effective communication and knowledge-sharing between DCH professionals can be supported by creating a DCH network of experts, companies and organisations, enabling them to find and interlink with one another through specialised social media. Initially, such data will be collected through the ViMM website and may later be integrated into an existing sustainable platform (e.g. LinkedIn). These profiles will include categories of skills and expertise to help users to filter and find potential partners or clients.



5 INVOLVEMENT OF BENEFICIARIES, ADVISORS AND EXPERTS

Each of the seven ViMM partners is responsible for one of the seven Thematic Areas (TA) and the three Working Groups (WG) within it. In this capacity they have supervised and facilitated the WG process, including identifying experts, convening meetings and facilitating online communications which led up to the Berlin meeting.

Before Berlin, each partner produced draft Propositions for their TA, based on the outcomes of their WG. In Berlin, each partner was responsible for facilitating the Day 1 meeting for their TA and for producing revised Propositions to present to the Plenary meeting on Day 2. While CUT has taken the lead in synthesising the Propositions, each partner has provided comments and advice.

A list of members of each Working Group is provided on the ViMM Platform, for example for TA 1 at <https://www.vi-mm.eu/ta1-definition/>. In all, over 150 experts participated including a number of members of the ViMM Advisory Panel. A list of invited experts who were registered participants in Berlin is provided at Annex 1. The role of the appointed Chair of many of the WG was a crucial ingredient in producing a successful outcome.



6 DEVIATIONS FROM THE DOW AND THEIR IMPACT

There are no important deviations to report

7 CONCLUSIONS AND NEXT STEPS

Drawing on the Synthesis of Propositions, a draft Manifesto has been produced and widely circulated via the ViMM Platform, Social Media and at dissemination events including the European Year of Cultural Heritage week in Berlin (18-24 June). Numerous comments are being received and the product of this will be D7.2 *ViMM Manifesto* due in M23- August 2018, but in all probability finalised before then.

Work has now commenced to convert the work to date into a Roadmap in support of the Manifesto, subsequently to be enhanced by a more detailed Action Plan, which will be discussed and validated at key meetings of the project such as the EuroMed Conference in November 2018 and at ViMM's final International Conference, now planned to be held in Brussels during Month 29 (February 2019). This latter meeting will also culminate efforts to achieve 'buy-in' from stakeholders to delivering the Roadmap and Action Plan. The relevant Deliverables in the DoA are:

D7.3 *Action Plan and Roadmap for VM* (due M25 – October 2018)

D7.4 *International Conference* (due M28 – January 2019)

The expectation of the consortium is that ViMM is on track with this important policy support stream of work and remains well-placed to deliver on relevant impact areas from the DoA, subsequently updated with Indicators, including the following:

IA 1 By establishing a strong collaboration between well-selected partners and the members of the Advisory Group, across a well-balanced choice of Thematic Areas, ViMM will create the conditions for a strong professional, political and societal impact.

Indicator

The outcomes of the consensus-building process following the meeting of all TAs, Advisers and Experts in Berlin, April 2018 are of sufficient quality to enable the design of the ViMM Manifesto, Action Plan and Roadmap, covering all the necessary aspects and activities

IA 4 By helping establish, through the Definitions TA, an evidence-based policy focus, clear terminologies and standards, leading up to the European Year of Culture in 2018 and beyond, ViMM will support the broad range of stakeholders in VM in establishing a well-defined path in future research, innovation and implementation and the establishment of an integrated policy for Cultural Heritage in Europe.

Indicators

- ***The ViMM definition of VM is adopted by at least three major international organisations in CH.***
- ***ViMM's recommendations on standards for DCH form part of a Roadmap and Action Plan, integrated by the European Commission in its investment planning.***
- ***ViMM engages at least 10 of the top 20 identified key international organisations in active policy dialogue toward an integrated policy on DCH.***

IA 12 The ViMM actions will enhance the influence of the EU in the broader European area and the Northern Africa countries. Particularly promoting the excellence of Europe in the digital heritage valorisation through an open, efficient and democratic methodology, it will contribute essentially to the policies of the Council of Europe, linking cultural policies with the extension and deepening of democratic values “cultural access and participation for different groups of the population or multi-stakeholder governance issues were seen as important themes to be dealt with”, (Compendium of Cultural Policies and Trends in Europe) ViMM is introducing effectively the multi-stakeholder governance model, proposed by the Council in the field of culture, “bringing stakeholders together to participate in the dialogue, decision making, and implementation of solutions to common problems or goals, in a consensus-based decision-making and operating in an open, transparent and accountable manner’. It should enhance democracy by ensuring that decisions made are reflective of and responsive to local concerns and to the broadest range of those who must bear the consequences. It should enhance democracy by making democratic processes more flexible and responsive, able to adjust to changing contexts circumstances, technologies, impacted populations”. The active involvement of the ViMM partners in EUROMED Conferences will provide a solid base to involve the Mediterranean Country’s stakeholders in the ViMM process, expanding its reach and impact in this critical area for Europe in terms of culture, democracy, economic growth.

Indicator

These goals of IA12 are clearly reflected in the ViMM Manifesto, Roadmap and Action Plan, which is recognized and integrated by the European Commission, Council of Europe, UNESCO and other policy-making bodies.

IA 13 Additionally the ViMM impact will enhance and promote the socioeconomic development through its actions, in various the socioeconomic components as defined by the Council of Europe, to be addressed by the project developments. Concretely, it will have a tangible impact in social cohesion: multicultural orientation (linking communities and assets all over Europe and abroad and promoting new multicultural collective identities), Integration of disabled persons (enhancing disabled friendly digital access to cultural heritage assets), innovation and creativity (enhancing social relevance of new ideas, and creating opportunities for start-ups of new innovative cultural oriented businesses around VM’s), education (promoting new processes of learning and training offer around VM), Economy (enhancing



Creative and cultural industries, the tourism and attractiveness of destinations, the productive use of cultural resources as driver for growth and employment opportunities and the cultural sponsorship and patronage) and Society and social behaviour (enhancing the knowledge understanding and capacity for action, creating and retaining identity, contributing to community development, fostering civic participation).

Indicator

Relevant and influential stakeholders from each of the fields described in IA13 endorse and validate the socioeconomic findings and recommendations of ViMM during its final events and commit to carrying them forward.

ANNEX 1 – LIST OF EXTERNAL EXPERT PARTICIPANTS REGISTERED FOR BERLIN CONSENSUS MEETING (EXCLUDING PROJECT PARTNERS)

Thematic Area 1 – responsible partner - CUT

Susan Hazan	Milica Tapavički-Ilić
Cettina Sangatti	Eleftheria Paliou
Spyros Vosinakis	Stefanie Wefers
Elena Lagoudi	Egle Butkeviciene
Sander Muenster	Rafaela Neiva Ganga
Nikos Grammalidis	Tamara Sevic
Eleanor Fink	Antonella Fresa
Kate Fernie	Lizzy Jongma
Antonia Moropoulou	Andreas Georgopoulos
Isabel Rodríguez-Maribona	Adel DANISH
Simona Marchesini (AELAW)	Alex Yen

Thematic Area 2 – responsible partner KIBLA

Bogdan Steh	Francesca Guerrera
Matjaz Pozleb	Nikos Frangakis
Nausikaä El-Mecky	Chris Vastenhou

Thematic Area 3 – responsible partner SPK

Trilce Navarrete	Walter Koch
Thomas Bremer	Juergen Frick
Krisztian Fonyodi	Petros Patias
Goran Zlodi	Fanet Göettlich
Marko Grobelnik	Alexander Hennig
Marco Rendina	Regine Stein
Marc Jacobs	Roger Evans
Michael Freundt	Daniel Blersch

Thematic Area 4 – responsible partner FORTH

Nitin Dhemre	Fotis Liarokapis
Stella Sylaiou	Paul Zikas
Michael Tsioumas	Christoph Held
Athina Grammatikopoulou	Constanze Fuhrmann
Nils Huebner	Stephanie Bertrand

Thematic Area 5 - responsible partner UPF

Daniel Pletinckx	Alfonisa Pagano
Marc Hernández	Cèsar Carreras
Oriol Vicente	Maro Alexaki
Isis Ruiz	Despoina Lambada
Athanasios Sideris	Blair Parkin
Conxa Rodà	Harry Verwayen
Albert Sierra	

Thematic Area 6 – responsible partner UNIGE

Frank Boochs	Rui Filipe Antunes
Goffredo Haus	Christian Degrigny
Pierre Grussenmeyer	Victor-Jan Vos
Guillaume Stern	Jef Malliet
Gilles Falquet	Georgia Angelaki
Yacine Bensamour	Gabriele Monti

Thematic Area 7 – responsible partner 7 REASONS

Savvas Varitimiadis	Anna Bentkowska
Frank Drauschke	Dirk Houtgraaf
Catherine Hickley	Wolter Braamhorst
Piotr Kuroczynski	Cristian Postelnicu
Raffaella Brumana	Werner Schweibenz