SPICE

Social cohesion, Participation, and Inclusion through Cultural Engagement

D7.1 EVALUATION METHODS PROTOCOLS

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SPICE consortium

No.	Short name	Institution name	Country
1	UNIBO	ALMA MATER STUDIORUM - UNIVERSITÀ DI BOLOGNA	Italy
2	AALTO	AALTO KORKEAKOULUSAATIO SR	Finland
3	DMH	DESIGNMUSEON SAATIO - STIFTELSEN FOR DESIGNMUSEET SR	Finland
4	AAU	AALBORG UNIVERSITET	Denmark
5	OU	THE OPEN UNIVERSITY	United Kingdom
6	IMMA	IRISH MUSEUM OF MODERN ART COMPANY	Ireland
7	GVAM	GVAM GUIAS INTERACTIVAS SL	Spain
8	PG	PADAONE GAMES SL	Spain
9	UCM	UNIVERSIDAD COMPLUTENSE DE MADRID	Spain
10	UNITO	UNIVERSITA DEGLI STUDI DI TORINO	Italy
11	FTM	FONDAZIONE TORINO MUSEI	Italy
12	CELI	CELI SRL	Italy
13	UH	UNIVERSITY OF HAIFA	Israel
14	CNR	CONSIGLIO NAZIONALE DELLE RICERCHE	Italy

Executive summary

The document is a description of the Social Cohesion, Participation and Inclusion through Cultural Engagement, SPICE H2020 project components. It outlines the major components consisting of a socio-cultural layer comprising five (5) Case Studies carried on within museum institutions and a technical development layer including a suite of advanced information processing tools brought together in one design to deliver interpretive possibilities that support citizen curation methodology. The results are aimed at addressing societal challenges and supporting social cohesion and more inclusive and engaging environments. They include research into new applications and tools that use novel Citizen Curation methodology to allow accessibility through engagement, reflection, reinterpretation and sharing of contemporary and historical heritage. These tasks, that also aim to instantiate new ways of experiencing cultural heritage, are explored and developed via artistic and co-design activities carried out in five (5) Case Studies.

Document History

Version	Release date	Summary of changes	Author(s) – Institution
v0.1	6/11/2020	First draft released	Aalto, DMH
v0.2	10/11/2020	Second draft released for general feedback	Aalto, DMH
v0.3	16/11/2020	First final version released for comments and feedback from the project board and other partners in SPICE	Aalto, DMH
v0.4	2/12/2020	Incorporated feedback from all the other members of the SPICE consortium	Aalto, DMH, FTM, IMMA, OU, UCM, UH, UNITO
v1.0	9/12/2020	Incorporated changes suggested by the Ethics Advisor. Version submitted via portal.	Aalto, DMH, FTM, IMMA, OU, UCM, UH, UNITO

List of abbreviations and terms

AI - Artificial Intelligence

AR - Augmented Reality

CoI - Communities of Interest

CoP - Communities of Practice

GDPR - General Data Protection Regulation

HCD - Human Centred Design

HCI - Human Computer Interaction

LDH - Linked Data Hub

PM tool - Project Management tool that will be used by WP7 for communication between the Case Studies and WPs in order to keep track of tasks and requirements.

STS - Sociotechnical systems

UX - User Experience

VR - Virtual Reality

WP - Work Package

Table of Contents

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1. INTRODUCTION

The document provides a description and recommendations of how the different aspects and components of SPICE project can be evaluated. The evaluation parameters proposed follow principles developed as part of the 2005 Faro Convention[1] which defined accessibility as a multifaceted concept with multiple dimensions including the physical, intellectual, financial, social, emotional, attitudinal, among others. In this context, barriers preventing people from taking advantage of the cultural services provided by heritage institutions assume different shapes and forms from restriction of opening times, to high admission fees, to the lack of clear signage and to the non- availability of information in alternative formats such as for example Braille (BSL), Italian Sign Language, plain English or Finnish.

1.1. ACCESSIBLE EXPERIENCES OF CULTURAL HERITAGE THROUGH TOOLS THAT FACILITATE CITIZEN CURATION METHODS

Social Cohesion, Participation, and Inclusion through Cultural Engagement, abbreviated as **SPICE** is a European research project funded through the H2020 Framework. The SPICE project aims to promote inclusiveness, accessibility and diversity whilst simultaneously supporting social cohesion via engagement with cultural heritage through novel citizen curation methods and experiences.[2] Key challenges here involve the design and implementation of new methods and tools within collaborative and participatory environments that foster reciprocal cultural understanding and resilience strategies.[3] SPICE work tasks also deal with curation of digital assets and advanced digitisation insofar as it aims to go beyond appearances and into recreating not only the visual and structural information, but also the experiences, stories and know-how associated with particular socio-historical contexts. Among the key challenges faced is the development of a distributed ecosystem to support citizen's engagement with heritage through the use of citizen curation methods. In the SPICE project, co-design and participatory processes are employed to enable personal and collective interpretation of cultural artifacts and heritage as well as their reflection through multiple alternative viewpoints.

1.2. FIVE UNIQUE CASE STUDIES FEATURING PARTICIPATORY AND CO-DESIGN ACTIVITIES

The sites of the SPICE H2020 project cover diverse landscapes including geographic, cultural and linguistically distinct contexts. These are Finland in the Nordic region; Ireland and the

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[1] FARO Convention Action Plan Handbook 2018-2019. https://www.coe.int/en/web/culture-and-heritage/faro-action-plan, accessed 24/10/2020

[2] Social cohesion, Participation, and Inclusion through Cultural Engagement, CORDIS EU Research Results, https://cordis.europa.eu/project/id/870811, accessed 07/12/2020.

[3] DT-TRANSFORMATIONS-11-2019: Collaborative approaches to cultural heritage for social cohesion, https://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-societies_en.pdf, accessed 24/11/2020.

United Kingdom in Northern Europe and Spain, Italy and Israel in Southern Europe and the Mediterranean respectively.

There are five (5) Case Studies in the project and each one of them involves a museum in a different European or Associated country. The museums participating in the project include:
- Design Museum, Helsinki (DMH), Finland
- Irish Museum of Modern Art (IMMA), Dublin, Ireland
- Hecht Museum, Haifa, Israel
- Galleria D'arte Moderna (GAM), Turin, Italy
- Museo Nacional de Ciencias Naturales (MNCN), Madrid, Spain

In addition to heritage institutions, there are seven (7) research institutes located at universities of renown accompanied by three (3) business partners that play roles in the work being carried out.

Case studies and their shortened name:

WP	Short name	Institution name	Country
7	DMH	DESIGNMUSEON SAATIO - STIFTELSEN FOR DESIGNMUSEET SR	Finland
6	GAM	GALLERIA D'ARTE MODERNA	Italy
3	Hecht	HECHT MUSEUM	Israel
4	IMMA	IRISH MUSEUM OF MODERN ART COMPANY	Ireland
5	MNCN	MUSEO NACIONAL DE CIENCIAS NATURALES	Spain

Table 1: Case studies with their short name.

1.3 TIMELINE OF CASE STUDY ACTIVITIES

WP7 coordinates with the Case Studies the course of their development in order to integrate exploration, development, use and testing of tools and methods for citizen curation. The timeline below illustrates the deliverables of WP7 and the case study activities:

DELIVERABLE NUMBER (WP7)	DELIVERABLE	DUE DATE (IN MONTHS)
D7.1	Evaluation methods and protocols.	6
D7.2	Socio-technical (STS) roadmap with project management tool integrating the Case Studies with **SPICE** systems.	9
D7.3	Case studies progress and plan.	12

D7.4	Review of Socio-technical roadmap with project management tool.	24
D7.5	Case studies progress and plan.	24
D7.6	Case studies are fully operational.	30
D7.7	Case studies final progress and plan - final version.	36

Table 2: WP7 list of deliverables.

1.4 USER EXPERIENCE OF HERITAGE THAT ALLOWS FOR REFLECTION, REINTERPRETATION AND SHARING

Since user experience (abbreviated as UX) is an extremely important consideration throughout the process of design of experiences for and about heritage, the testing of SPICE toolkit utilizes user-centred design methodologies including participatory and co-design methods involving our user communities. Through these activities, we seek to understand and assess how citizen curation tools can enable reflection, reinterpretation and sharing of heritage.

2. SPICE SYSTEM ELEMENTS

The complex organizational structures of socio-technical systems such as SPICE can be described as consisting of dynamic interactions occurring between people and technology within the entire system. Among the main SPICE system elements there are two types of infrastructure that are of particular interest to the project, namely:
- social and cultural infrastructure(s)
- technical infrastructure(s)

An organizational development approach that is often used to mediate between the two above-mentioned infrastructures is the Sociotechnical systems (STS) design. A key criterion for successful organizational performance is not only about infrastructural optimization. Interaction and communication between the social and technical aspects need to be included as well.

2.1 SOCIAL AND CULTURAL INFRASTRUCTURE(S)

Communities with individual members and stakeholder groups interested in heritage are one of the main units of analysis employed to study the developing social and cultural infrastructure(s) of SPICE. However, we would also like to work with groups who are not initially interested but who might also decide to partake in citizen curation activities developed. For each of the communities, or stakeholder groups described in the next pages, we propose a series of metrics as a basis for evaluation.

Prior to any type of interaction with any of the communities mentioned in this section, Case Studies and other SPICE researchers must obtain informed consent from the participants through consent forms that have been developed in the project and which adhere to the guidelines of GDPR. In this manner the project seeks to cater to the sensitivity of participants and ensure that there is no physical or emotional harm incurred during the proceedings. Therefore, the consent must be explicit, confirming that the participants understand every aspect of the activities they will partake in.

2.1.1 End-user communities

Simply put, end-users are people (e.g., individuals, actors) who ultimately use or intend to use a product or service being developed. It is often thought that such people have innate know-how regarding the context and situation of use for an end product. In SPICE, these individuals are studied from the perspective of the communities that they belong to. Among the communities that they might constitute:
- Groups of visitors who are already visiting the museum on a rare, occasional, frequent or regular basis.
- Groups who access the museum's services for purposes such as attending museum organised activities including workshops held either at the museum or in different locations. Or groups attending webcasts and other activities held by the museum in

virtual spaces. As we shall explain below, these might be further organised into Communities of Practice or Communities of Interest.
- Groups who would be potentially interested in using the museum's services, but have not yet done so. These include groups that were not previously interested in visiting a museum or accessing its services, but have decided to do so after the enhancements brought about at SPICE.

Metrics:
Among the metrics that we propose to use in the evaluation are
- Responses to qualitative surveys.
- Semi-structured interviews.

These are carried out before and after the implementation of major deliverables. Some of these surveys and interviews take place within the context of the creative workshops that are carried out as part of the Case Studies. The qualitative surveys carried out in all five 5 cases as well as the contents developed as part of the work done in SPICE are *grounded* on User experience (UX) design methods. (See Appendix 1.)

Table 2 below describes some of the individual types (or Actors) that we envision would participate as co-designers in the activities of the SPICE project. It might be possible to also regard these individuals as members of different communities that are involved in activities with the heritage institutions affiliated with SPICE. In the next few pages, we also devote time to describing these communities.

ACTORS	TYPE	CASE STUDY
Students and learning groups	Primary school as well as high school	MNCN
	Special education needs groups	GAM, IMMA, MNCN
	University	GAM, Hecht
Senior citizens	Based on background: - Age - Family type	DMH, IMMA
	Requiring special assistance	
Remote dwellers	Physically distant areas such as: - Suburban - Semi-rural - Rural	DMH, GAM, Hecht, IMMA, MNCN
	Virtual online communities	

Minority communities	Cultural minorities: - Religious minorities - Linguistic minorities	Hecht
		DMH, GAM, Hecht, IMMA
	Asylum seekers	DMH, IMMA
	Special needs groups that may include: - Deaf community - Requiring mobility assistance	DMH, GAM, IMMA, MNCN
Hybrid communities	Communities that incorporate more than one of the previously mentioned characteristics.	DMH, GAM, Hecht, IMMA, MNCN

Table 3: End-user communities involved in the Case Studies.

2.1.2 Communities of practice (CoP)

The term Communities of Practice (CoP) is frequently used to refer to practitioners and professionals brought together by the relations of mutual engagement that emerge through their professional practices.[4] Lave and Wenger initially coined the term to describe learning activities within a group of "people who share a concern or a passion for something they do and learn how to do it better as they interact regularly".[5] Becoming a full participant in a community plays an important part in the process of learning.

> Metrics:
> - The number and relevance of activities initiated and implemented.
> - Figures that indicate the dissemination of knowledge in communities.
> - Statistics that demonstrate the institution's (museum) networks' expansion.

The following set of actors is important to all Case Studies; however, the type may vary based on the Case Study. They are categorised as follows:

ACTORS	TYPE
Practicing artists	Diverse domains
Researchers	University based

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[4] Lave, J., & Wenger, E. (1991). *Learning in doing: Social, cognitive, and computational perspectives. Situated learning: Legitimate peripheral participation*. Cambridge University Press.

[5] Wenger, E. (1998). *Communities of practice, learning, meaning, and identity*. New York: Cambridge University Press.

	From additional institutions: - Affiliated with universities - Independent organizations - Independent without any involvement with an organization
Museum professionals	Curators
	Educators
	Public relations personnel
Mediators	Social and health care workers
	Library officers
	Sign language interpreters
Network of work with end-user communities = SAME AS MEDIATORS	Community managers and activists

Table 4: Communities of practice involved in the Case Studies.

2.1.3 Communities of Interest (CoI)

Communities of interest (CoI) are groups or communities of people who share a common interest. Wenger and Snyder (2000) outline a clear difference between CoI and CoP by outlining that CoPs share a common interest but are active practitioners as well. Fischer (2001) has proposed that CoIs can bring together stakeholders from different CoPs that share a collective concern with the resolution of a problem.[6]

Metrics: - Number and type of relevant activities initiated and implemented. - Expansion and depth of individuals and communities' involvement and attendance at museum activities. - Surveys to measure engagement and satisfaction amongst individuals and communities.

The actors involved as possible Communities of Interest are listed and categorized below:
   I.   **Hobbyists and activity groups**

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[6] Fischer, G. (2001). "Communities of interest: Learning through the interaction of multiple knowledge systems". In the *24th annual information systems research seminar in Scandinavia*. Retrieved November 25, 2007, from http://l3d.cs.colorado.edu/~gerhard/presentations/slides-iris2001.pdf, (Accessed 24/10/2020).

Case Studies will identify hobbyists and/or activity groups as a CoI. Consideration should be given to engagement in the participatory design and co-design activities of each case study with groups such as these. The choice of groups should be clearly outlined along with explanations for the choice of certain groups over others.

The table below demonstrates examples of hobbyists and activity groups for each case study:

CATEGORY	TYPE	CASE STUDY
Art	Collectors	DMH, IMMA
	Enthusiasts	
Design	Collectors	DMH
	Enthusiasts	
Sign language	Researchers	GAM
	Learning clubs	
	Linguists	
Ancient Israel	History enthusiasts	Hecht
	Archaeologists	
Nature	Hiking clubs and enthusiasts	MNCN
	Bird watching groups	

Table 5: Hobbyists and activity groups involved in the Case Studies.

II.   Activist groups and individuals

Activists are people campaigning for the improvement of social conditions and, in this case, working towards it through dialogue within the public realm. Case Studies should illustrate a view of how actors such as these interact within the environment of their cases. At the same time, they should explain and justify why certain activist groups have been chosen, omitted, or even if none of these groups are involved.

Based on the DMH Case Study, here we include examples of some activist groups which might also coalesce into CoI:

CATEGORY	TYPE	DESCRIPTION
Art and design activists	Engaged in activities related to sustainability and environmental preservation such as: - Bioart Society (SOLU) - Pixelache	
Environmental and sustainability networks and groups		An example in Helsinki is DODOry that collaborates with DMH.
Humanitarian groups	Assisting children with illnesses	
	Assisting asylum seekers	
Political entities with similar interests		This might be more challenging and may inevitably lead to some form of polarization or alienation amongst certain target audiences, however it is worth consideration, especially for IMMA and Hecht.

Table 6: Activist groups and individuals involved in the Case Studies.

III. Virtual and hybrid communities

These communities include the ones that exist in a 'virtual' realm as well those that are able to engage with museums in the physical and digital environment. Each case study should also pay special attention to these communities, seeking to discern whether they coalesce CoPs or CoIs:

CATEGORY	TYPE	DESCRIPTION
Social media	Groups on mainstream platforms: - Facebook - Twitter - Instagram	In recent years, there has been considerable engagement in giant social media platforms due to their role in data breach such as the Cambridge Analytica scandal.[7]
	Alternative platforms: - MeWe	These are platforms with fewer users but claim to be better at

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[7] Cambridge Analytica, https://en.wikipedia.org/wiki/Cambridge_Analytica, accessed 07/12/2020.

	- Meetup - Vero	protecting privacy.
Telematic channels	Podcasts on - Mainstream channels such as YouTube and Spotify - Local channels such as Aalto Summer School podcast	Attempts could be to secure a presence as guests on a podcast and highlight the range of activities carried out at the museum.
	Webcasts	An example is DMH's NODUS talks on sustainability.

Table 7: Virtual and hybrid communities involved in our Case Studies.

IV. Support institutions

These institutions play important roles as mediators and even direct supporters of heritage initiatives such as **SPICE** H2020. Among the institutions that we have singled out for attention include:

CATEGORY	TYPE	DESCRIPTION
Public institutions	National institutions of governance such as: - Ministry of Culture - Ministry of Education	Policy development and implementation has a direct impact on the activities of the CoIs involved in the SPICE H2020 project.
	Municipalities such as: - City council - Local libraries for events and workshops	Municipalities whose policy work might extend (or constrain) the activities of the heritage institutions.
Private institutions	Foundations	Private institutions are those who might be either allies (or opponents) of the work and activities of the heritage institutions. These are entities whose activities might coincide with those of museum institutions and whose economic and societal support is often crucial.
Independent	Universities	These are included when

organizations		universities act as places where research activities directly relate to the heritage institutions' activities.
Non-governmental organizations (NGO)	NGOs such as: - Humanitarian such as Red Cross - Environmental such as Greenpeace	This is taken into account only if there is a case study that is planning to collaborate with an NGO.
Corporate service organizations	Examples: - Padaone games - Finnish companies that provide services for refugees	They might intervene to support a particular activity.

Table 8: Support institutions involved in the Case Studies.

V. Businesses with intersecting interests such as any Design, Architecture or Technology firms.

2.1.4 Additional stakeholders

There might be certain stakeholders that do not fall under the categories of end-user groups, CoPs or CoIs. Examples of actors such as these are provided in this subsection.

Metrics:
- Activities of relevance that are initiated and implemented.
- Understanding and monitoring the role as well as involvement within the system.

These are to be evaluated only if a Case Study plans to collaborate with any of the following actors:
I. Investors.
II. Sponsors: Businesses tied to the museum who are not necessarily entirely interested in the topic, however, choose to remain financially tied.

2.2 TECHNICAL INFRASTRUCTURE(S)

The technical infrastructure(s) at SPICE refers to the software and network systems that also include the datasets within each. These infrastructure(s) seek to aid and enhance the process for citizen curation by providing a technological foundation for the museums involved. They

are divided into backend and frontend tools and assets wherein the backend refers to the infrastructures that the users do not see or directly interact with while the frontend is concerned with interfaces and contents that are directly accessed by users.

2.2.1 Backend tools and assets

In this document the term Backend tools is used to refer to the data access layers in the software infrastructure.

Metrics:
- Alignment of the tool's outputs will be measured through their use as part of participatory co-design methodologies in workshops carried out at each of the Case Studies of SPICE H2020.

I.   Recommender system – WP3

The main aim of WP3 is the development of tools in order to support the exploration of users' interpretations on museum objects. One of these tools is the AI-based recommender system that will suggest relevant content to end-user communities.[8] For example, when the recommender system has sufficient information and knowledge about the characteristics of a user within a community, it could suggest *alternative perspectives* to broaden the framework of dialogue and ultimately support cohesion and understanding.[9]

The graphic below shows an example of how categorization operates drawn from the Hecht museum Case Study. Based on the subject's placement within a category's attributes, the rule infers different recommendations to a user.[10]

Category	Characteristics	Rule for the recommender
Demographic	Age greater than 60	The recommender shows pictures of artifacts from over 50 years ago.
	Age younger person	Recommender shows short videos.
Worldview	Politics	Recommender attempts to show an opposing opinion within the space of 'reasonable discourse' and excluding hate-related content in order to demonstrate alternative perspectives and provoke

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[8] WP3's recommender system is accessible only to the SPICE consortium and the SPICE heritage institutions.

[9] This description has been derived from the project's grant agreement.

[10] The *SPICE H2020 Autumn Mini-Conference* was held during 29 October 2020 and the rule for the recommender was demonstrated by Alan Wecker from WP3. The purpose of the Conference was precisely for the partners to work together on the Case Studies and Evaluation Requirements. A paper discussing the procedures and results of the Mini-Conference will be written in the near future.

		thinking from other points of view.
Education	Level (High)	The recommender shows more abstract material.

Table 9: Rule for the recommender used by WP3's Alan Wecker at the SPICE mini-conference.

The important precursors to the development of the recommender system are the *user and community models*. A *user model* is a collection of characteristics associated with the envisioned users of a system.[11] In this case, the users are citizens and visitors engaging with the museum. The community model follows the same rule as the user model, wherein the 'community' replaces the 'user'. Overall, the input received from the user and community model is fed into the recommender system for it to determine the type of content to recommend to a single user or to end-user communities. However, concepts and sentiments are extracted from textual contents inputted by users in order to derive these communities. The diagram in Figure 1 demonstrates the pipeline and processes of the recommender system created in WP3 that maintains interdependencies with the other WPs.[12]

Metrics:
- Distance measures within a community as well as connections to other communities for recommendation.
- Measurement of the nature of bias imposed by the recommender while suggesting contents to users.
- If possible and practical, examination of whether alternative perspectives are absorbed or disregarded by the users.

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[11] Kobsa, A. (2007). Generic User Modeling Systems. In P. Brusilovsky, A. Kobsa, & W. Nejdl (Eds.), *The Adaptive Web: Methods and Strategies of Web Personalization* (pp. 136–154). Springer. https://doi.org/10.1007/978-3-540-72079-9_4

[12] WP3's pipeline and processes that lead to recommendation of content to users. Currently, most of the information about these processes is accessible only to the SPICE consortium and the SPICE heritage institutions.

Fig 1: WP3's pipeline and processes that lead to recommendation of content to users.

The diagram in Figure 1 also shows how the user generated content includes users' interpretations, selections and feedback to artifacts they view or interact with. This content is analysed in order to create a user model that is continuously updated based on user input as well as ontology data received from artifacts and activities. This data is also used to create and update community models. All of these inputs mentioned are fed into the recommender system which also receives data from WP6's scripts that direct the nature of recommendation ultimately to the end user.

Requirements from the Case Studies:
WP3 will define and implement a generalized Case Study user model prototype as well as provide examples to all the parties involved (D3.1 in Month 12).
- Every Case Study will examine the generalized model prototype and customize and adapt it to fit their own user and community model.

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Progress regarding these requirements for the Case Studies will be followed closely and updated within the PM tool.

II. Linked Data Hub – WP4

WP4 will develop the Linked Data Hub to *connect cultural objects, collections, and citizen contributions*. The main objectives of the Linked Data Hub that support museums include:

- exposing data from the museums to the SPICE network
- control visibility and access to this data
- collect data from use cases of the Case Studies
- trace and analyse its usage

The figure below demonstrates the technical specifications of the linked data architecture:
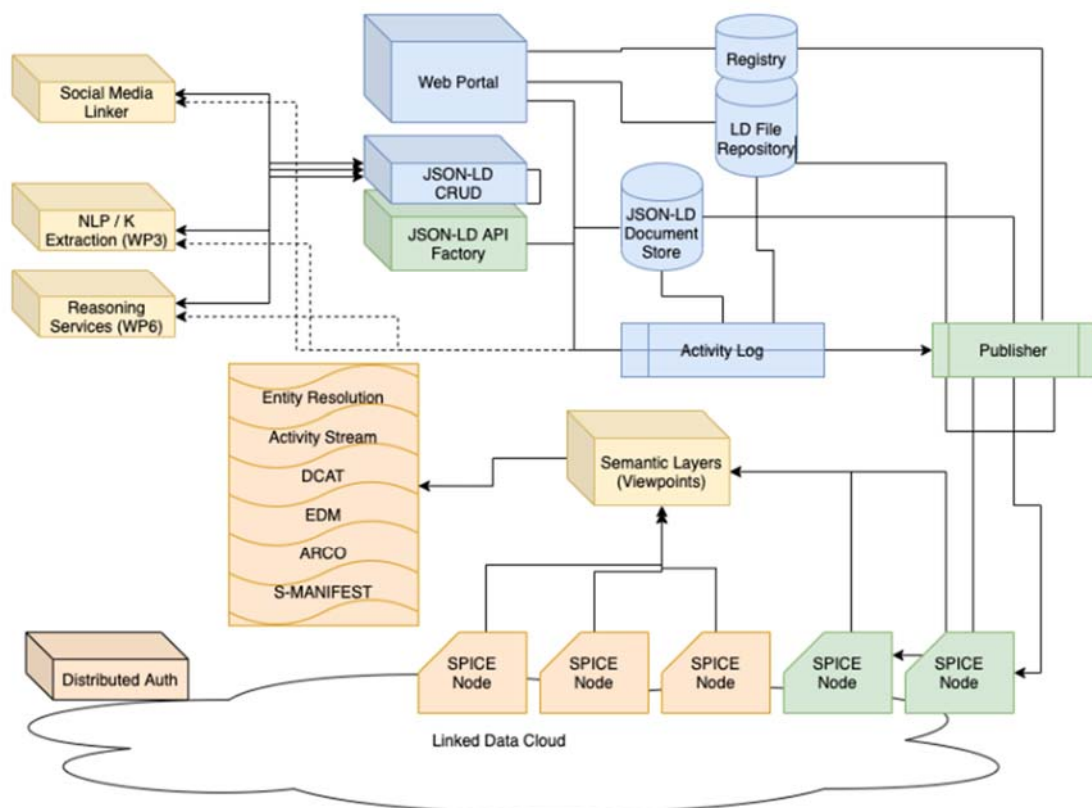
Fig2: WP4's linked data architecture color-coded according to:
- Blue - Implemented systems
- Green - Systems under testing
- Yellow - Next steps
- Orange - Undecided

Credit- Enrico Daga from WP4

Metrics:
- Level of support provided to the other backend systems for interlinking, discoverability and interoperability of digital assets.
- Strength of the security and privacy of the data stored in the LDH in relation to user data, accessibility of digital content, raising copyright violations, recommending fair practices and protecting certain content.

In order to develop the linked data infrastructure, WP4 aims to make datasets detached from applications and have it interchangeable as well as supporting the SPICE methodology through the MANIFEST that is being developed here.[13]

Here is an example of categories within the MANIFEST in relation to IMMA:

TYPE	IMMA CASE STUDY
Settings: Exhibition visit	Installation in museum family/response room
Settings: Workshop with artists	Co-design workshops with participating communities
Activities: Audio recordings	Possible alternative to phone text entry
Roles: Workshop leader	Yes
Purpose: Teaching & Learning	Yes (school scenario)
Tools/Instruments: Website	Likely
Content: Parts	Artworks, comments, tags
Workflow: Source	Yes. Source of artworks, contributions

Table 10: An example of MANIFEST under development by Enrico Daga and the rest at WP4.

As demonstrated above, the MANIFEST contains a list of settings, activities, roles, purposes, tools, contents and workflow.

Requirements from the Case Studies:
- Each *case study must fill up the types* in the MANIFEST sheet variables and *update them whenever there is a change*. A case study may add new types if it is necessary for their museum.
- WP4 will remain in touch with the Case Studies in order to gather requirements from the museums about data sharing such as metadata. A representative from each case study should attend the monthly "Museum Data Sharing" meetings to gather these requirements.
- WP4 also requires a series of use-cases from each case study and WP7 will be responsible for collecting these use-cases and this will be done through the PM tool.

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[13] The MANIFEST sheet under the development of WP4 is currently accessible only to the SPICE consortium and the SPICE heritage institutions.

III.   Ontologies – WP6

WP6 is responsible for creating the technical and representational infrastructure for supporting citizen curation as well as the implementation of the ontologies and clustering devices which represent the entities involved in citizen curation and in the reflective processes. Task 6.3 from WP6 involves the creation of an ontological network for citizen curation consisting of a citizen curation ontology and an interpretation ontology.[14] The citizen curation ontology includes the activities and interpretations that are created and shared amongst different groups of users. The interpretation ontology takes into account viewpoints, emotions, metaphors, values, etc.[15]

Here are some reference ontological models that WP6 has been considering for integration/expansion:

KNOWLEDGE AREA	ONTOLOGICAL MODEL
Emotion	ArsEmotica[16]
	Framester's DepecheMood[17]
Narrative	Labyrinth[18]
	Drammar[19]
	Curate and Storyspace[20]
Artwork Description	ArCo's Denotative Description[21]
Knowledge	Framester[22]

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[14] The ontological network for citizen curation is under the development of WP6 and currently accessible only to the SPICE consortium and the SPICE heritage institutions.

[15] The interpretation ontology is under the development of WP6 and currently accessible only to the SPICE consortium and the SPICE heritage institutions.

[16] *Arsemotica—Emotions in the social semantic web*. (n.d.). Retrieved November 5, 2020, from http://www.di.unito.it/~patti/arsemotica.htm

[17] *DepecheMood—A simple demo for emotion analysis of texts*. (n.d.). Retrieved November 5, 2020, from http://www.depechemood.eu/

[18] Damiano, R., & Lieto, A. (2013). *Ontological Representations of Narratives: A Case Study on Stories and Actions* https://doi.org/10.4230/OASICS.CMN.2013.76

[19] Lombardo, Vincenzo & Damiano, Rossana & Pizzo, Antonio. (2018). Drammar: A Comprehensive Ontological Resource on Drama: 17th International Semantic Web Conference, Monterey, CA, USA, October 8–12, 2018, Proceedings, Part II. 10.1007/978-3-030-00668-6_7.

[20] Mulholland, Paul & Wolff, Annika & Collins, Trevor. (2012). Curate and Storyspace: An Ontology and Web-Based Environment for Describing Curatorial Narratives. 7295. 748-762. 10.1007/978-3-642-30284-8_57.

[21] *Denotative Description Ontology (ArCo network)*. (n.d.). Retrieved November 5, 2020, from https://databus.dbpedia.org/ontologies/w3id.org/arco--ontology--denotative-description/

[22] *Framester/Framester*. (2020). framester. https://github.com/framester/Framester (Original work published 2016)

Scripting	Hico[23]

Table 11: Examples of ontological models based on their knowledge area under consideration by WP6.

The figure in the next page demonstrates the pipeline wherein WP6 is involved.[24]
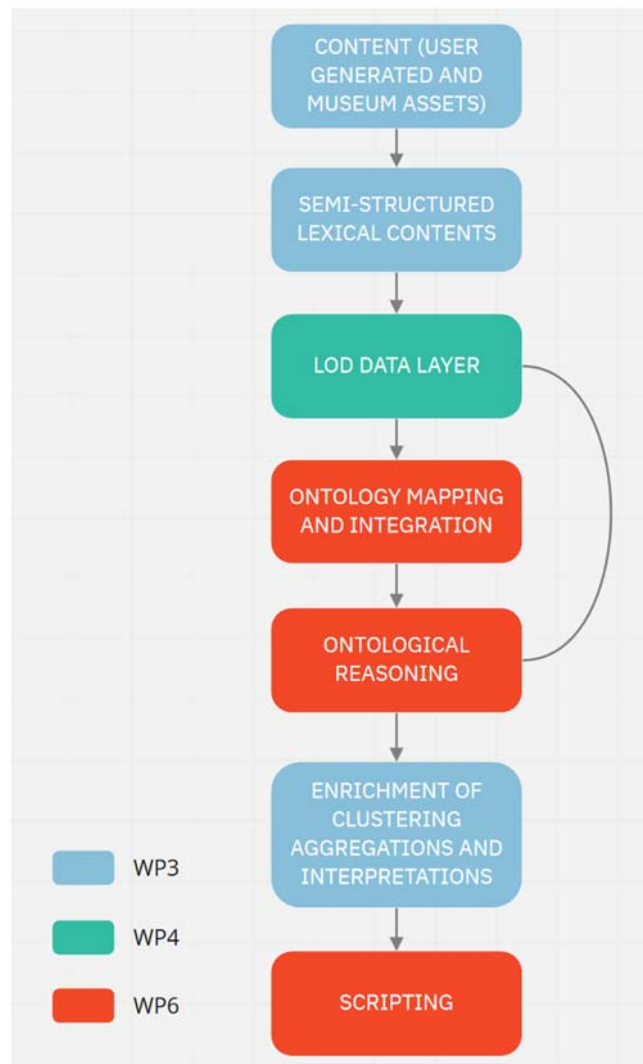
Fig 3: Work pipeline showing a detailed view of the process through which reasoning is carried out in the SPICE Toolkit.

As shown in Figure 3, the user generated data is collected in WP3 and stored in WP4's linked data hub. Ontology mapping, integration and reasoning is carried out using this data. Furthermore, WP3 implements consolidated data to enrich clustering aggregation and interpretations while developing user and community models. Based on these aggregates,

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[23] Daquino, M., & Tomasi, F. (2015). Historical Context Ontology (HiCO): A Conceptual Model for Describing Context Information of Cultural Heritage Objects. In E. Garoufallou, R. J. Hartley, & P. Gaitanou (Eds.), *Metadata and Semantics Research* (pp. 424–436). Springer International Publishing. https://doi.org/10.1007/978-3-319-24129-6_37

[24] Work pipeline and processes of WP6.

WP6 develops interaction scripts to be fed to the recommender in order to recommend relevant content to users. A point worth noting is that this pipeline is subject to modification.

Metrics:
- Coverage of the interpretation ontology in order to examine how well the narrative structure and contents of interpretations take into account varying perspectives, emotions, metaphors, modalities and values.
- Qualitative self-assessment and user surveys to estimate how the knowledge level reasoning supports citizen curation activities.

Here are some examples of questions posed by WP6 for the development of the ontological models in Task 6.3,[25] when considering an artwork as an example:
- What are the events represented in the artwork?
- What is the story represented in the artwork?
- What are the emotions associated with the representation of the artwork?
- Are there other artworks representing the same story of the artwork?
- Are there other artworks representing the same character?

WP6 shall provide a first sketch of an ontological model using data from GAM and Hecht by the end of November 2020 and this preliminary model could be used by WP3, WP4 and WP5.

Requirements from the Case Studies:
- Case studies should follow the development of the ontological model(s) and provide information whenever required. They will be informed through the PM tool.

IV. Scripting devices – WP2 and WP6

In SPICE, scripting is defined as connecting micro-activities such as tagging an image or viewing a visualization into a "workflow" that completes the interpretation-reflection loop.[26] Here is a simple example of a storytelling script:
- The curator provides a selection of artwork. The citizen can select one of the artworks, tell a personal story related to the artwork and send it to a friend. The friend can send a response to the person who wrote the story. The citizen can also choose to share the story with the curator. The curator makes an online exhibition featuring some of the contributed stories.[27]

As seen in the script above, the micro activities are:
- Selection of artworks: by the curator
- Telling a story that can be shared by the storyteller
- Comment or response to the story: by the story receiver

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[25] The ontological model is being developed by WP6 and is currently accessible only to the SPICE consortium and the SPICE heritage institutions.

[26] The scripting devices are under the development of WP2, WP4 and WP6. These are currently accessible only to the SPICE consortium and the SPICE heritage institutions.

[27] An example of a storytelling script by Paul Mullholand used by WP4 and WP6.

- Make the shared stories public: by the curator

Overall, the script contains roles, activities and several stages. The ideal mechanism to have these scripts accessible to the technical work packages is through the use of scenario design in WP7 and adding the roles and activities in the MANIFEST sheet.[28]

Metrics:
- Evaluation of interpretations and reflections based on the narrative qualities, richness, diversity and personal nature.
- Level of support provided for interpretation and reflection by the integrated methodological toolkit developed in T2.3.

Requirements from the Case Studies:
- Examine the consolidated literature produced by WP2 when it is released during Month 12 and provide any input required by WP2 for the development of the integrated methodological toolkit.
- While Case Studies have provided scenario design to WP7, it is very likely that more scenarios are needed in order to develop use-cases and scripts. WP7 will communicate with the Case Studies regarding this through the PM tool.

V. Additional data gathered

In addition to the backend tools and assets mentioned earlier, there are other types of datasets collected as well. Some of them are stored in repositories of WP4 while others are managed by the remaining technical work packages. These datasets include:

a. Demographic data
b. Location based
c. Textual data
d. Sensor based data
e. Media based data such as:
  - photographs
  - videos
  - screen recorded data from applications and softwares
f. Content management system-based data such as:
  - description of artefacts on websites
  - metadata
  - museum archives
  - database entries of collection(s)

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[28] The MANIFEST sheet under the development of WP4 is currently accessible only to the SPICE consortium and the SPICE heritage institutions.

Requirements from the Case Studies:
- Ensuring that the data that does not enter any SPICE repositories is protected is handled carefully in order to protect the privacy of participants and confidentiality of certain systems.

2.2.2 Frontend tools and assets

In this document the term Frontend tools is used to describe the presentation layer of the system, namely the user interface.

Metrics:
Evaluation of interface suitability will be done both as part of participatory co-design activities carried out in each of the Case Studies as well as in trial runs in activities taking place in each of the museum institutions participating in SPICE H2020 project.

I.   Interfaces – WP5

Interface design and implementation plays an important role in the SPICE Toolkit, since these act as mediators between the visitor and the content materials. Case Studies will need to consider the types of interfaces that will be used as part of their activities in their heritage institution. In a workshop, conducted by WP5, involving all the partners and held during our recent internal Mini-Conference organized by WP7, some of the interface options considered included:[29]

CATEGORY	TYPE	DESCRIPTION
Interfaces for a visit	No interface	Rather, heritage contents are located in the Museum's website and accessed via personal phones or other such devices.
	Audio guides	Visits are supported by mobile guides.
	AR interfaces	Visits aided by virtually augmented contents using a real space as a canvas.
	VR headsets	The visit takes place in a virtual environment inside an immersive VR headset.
	Webcasts	A live webcast tour or talk held by the museum.

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[29] The *SPICE H2020 Autumn Mini-Conference* was held during 29 October 2020. The purpose of the Conference was precisely for the partners to work together on the Case Studies and Evaluation Requirements. A paper discussing the procedures and results of the Mini-Conference will be written in the near future.

Interfaces for interpretation	Collecting	This invites visitors to select their favourite objects in order to curate a show.
	Tagging	Tagging allows social tagging of objects from visits.
	Interactive webcasts	Live webcast tours are held online wherein visitors' responses are collected as well as allowing other enhanced interactions.
Interfaces for reflection and scripting	Reflections through browsing	This type allows visitors to share their reflections on their journey.
	Reflections through the use of visual analytical tools	In this case, visitors explore their connections with people and objects.
	Scripting through the creation and browsing user stories.	*Storyscope* is an emblematic example of this type, wherein museum stories are explored through time periods using certain themes and/or settings.

Table 12: Examples of the types of interfaces were demonstrated by WP5 at the SPICE mini-conference.

There are more options available for selection here:
- Interfaces for a visit
- Interfaces for interpretation
- Interfaces for reflection & scripting

Metrics:
- Level of support provided by the interfaces for interpretive tasks such as tagging, collecting and/or storytelling based on the context.
- Level of support provided by the interfaces for reflective tasks such as browsing and exploration in order to understand a range of responses across sets of interpretations.
- Evaluating the usability and UX of the interfaces developed.
- Strength of the accessibility add-ons such as closed captioning and sign-language for integrated interfaces that support interpretation and reflection.

Requirements from the Case Studies:
Each of the Case Studies will consider and gauge the potential use of these interfaces for use in their museum-related activities.
- They will produce brief reports describing the interfaces they intend to use for their activities.
- Together with WP7 they will produce checklists to be used in interface evaluation according to accessibility, usability and user experience criteria.

II.   Content materials

These assets comprise content materials that exist as artefacts in a museum collection, such as for example images of diverse genera and type in contrast to content materials including textual input, narratives and audio-visual media *created by end-users participating in the project or by general audiences in relation (or as a response) to the work being done in* SPICE.

    i.   Existing in the museum – Case Studies
        a. Existing content within the museums participating in the project.
        b. Creation based on results of workshops with end-user communities, communities of practice and communities of interest.
   ii.   Created by end-users – Case Studies
        a. Input provided by end-users during workshops and other channels such as social media.
        b. Selection made by end-users out of an existing set of contents.
  iii.   Created by the general public – Case Studies
        a. Creation based on data gathered from the opinions and viewpoints of the general public.
        b. Selection made by the general public out of an existing set of contents.

3. REQUIREMENTS

3.1 INITIATING CITIZEN CURATION METHODS WORKFLOW

3.1.1 Process description

The following pages intend to give a concise description of the processes and elements involved in the use of citizen curation methods. These processes presume an interaction between citizens with heritage content that is mediated via the system's socio-technical infrastructure.

3.1.2 Input/outputs

At SPICE, there are several types of content that are handled through differing mechanisms, here are some considerations that need to be taken into account by the Case Studies and WPs:

CATEGORY	TYPE (INPUT & OUTPUT)	CONSIDERATIONS
Access content	Input user -> Output museum	Is there a minimum amount of content needed and if so, why?
		Is there a maximum amount of content and if so, why?
		What type of assets are being used and why? a. Images b. Text c. Audio d. Other
Explore content	Input user -> Output museum	Defining the nature and range of mechanisms for exploration.
		Observing the process of exploration.
		Whether to gather data during exploration such as: a. Time spent on particular artifacts. b. Nature of interactivity during exploration.

Select content	Input user -> Output museum	What are the range, i.e amount and type of contents that the system offers for selections?
		Clustering the selections.
		Reasoning and motivation behind the selections.
Interpret content	Input user -> Output user	Collecting several types of interpretations.
		Clustering the interpretations.
		Designing and iterating artifacts, activities, and systems based on interpretations.
Share content	Output user -> Input another user or museum	Enabling sharing if intended.

		Sharing within boundaries:
		  a. Between two users
		  b. Within a group
		  c. With public
		WP4 is working on measuring the impact of museum objects on social media platforms. Hence, case studies are required to follow up closely in the 'Museums Data Sharing' monthly sessions held by WP4.

Save/archive content	Input user -> Output museum	Designing a structure for archiving and deciding the type.

		Access to the archives:
		  a. Closed
		  b. Open

Table 13: Examples of the types of interfaces demonstrated by WP5 at the SPICE mini-conference.

3.2 USER EXPERIENCE

Within the context of SPICE, the User Experience (UX) broadly refers to an end-user's interaction with the front-end tools in order to foster engagement and reflection. However, the degrees of engagement, interpretation and reflection may vary considerably because the end-user's experience may not always satisfy the designer's goals. In his article, Robert (2014) outlines several characteristics of UX,[30] namely

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[30] Robert, J.-M. (2014). Defining and Structuring the Dimensions of User Experience with Interactive Products. In D. Harris (Ed.), *Engineering Psychology and Cognitive Ergonomics* (pp. 272–283). Springer International Publishing. https://doi.org/10.1007/978-3-319-07515-0_28

- personal and subjective
- multidimensional in terms of reasoning
- holistic coverage of varied interactions
- situated in a context
- dynamic over time.

These are essential considerations for designing meaningful and engaging experiences.

In a similar attempt towards classification, Hassenzahl and Tractinsky (2006) map UX within three facets,[31] namely

- beyond the instrumental
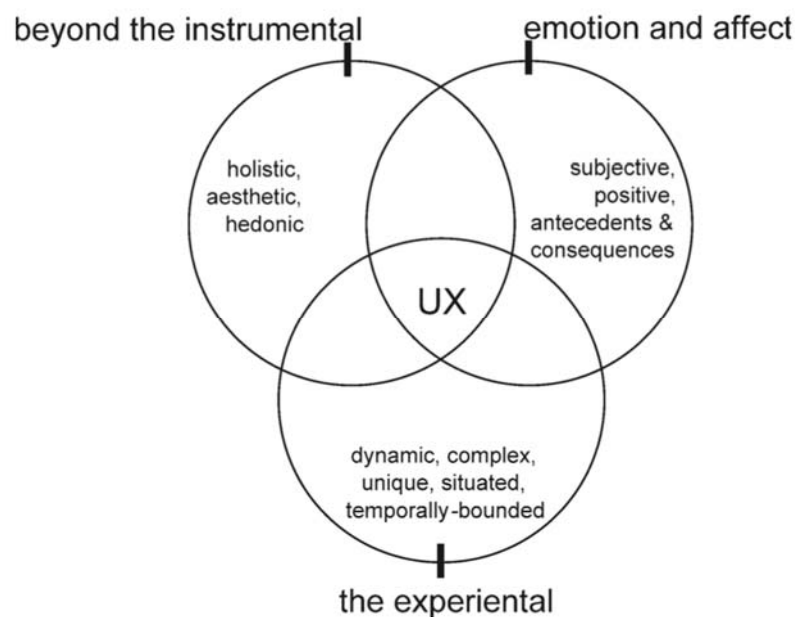- emotion and affect
- the experiential

Fig 4: Facets of UX, reprinted from Hassenzahl and Tractinsky, 2006.

In his thesis, Wu (2014) presents an overview of user involvement techniques that are oriented around the theories of human-centred design (HCD) for cultural institutions.[32] User involvement is addressed from several aspects that includes usability, participatory design, co-design, ethnography, and agile design methods. These techniques are analysed and used for the development of a series of tools that describes the service system, customer journey, and guidelines for stakeholders of cultural institutions.

Since SPICE is oriented around social cohesion, participation and inclusion, a meaningful UX would also consider:

1. Fulfilling engagement
    I. Learning through gaining new knowledge and insights as well as reflection.

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[31] Hassenzahl, M., & Tractinsky, N. (2006). User experience—A research agenda. *Behaviour and Information Technology*, *25*, 91 – 97. https://doi.org/10.1080/01449290500330331

[32] Wu, J. (2014). *User involvement in service design: A case study on designing a new service concept for cultural institutions* [Aalto University]. https://aaltodoc.aalto.fi:443/handle/123456789/14010

II.   Different types of entertainment that include elements of fun and motivation in order to enhance learning and other activities.

III.   Serving as a platform for activism, debate and critical discourse.

IV.   Social networking that allows citizens to stay connected and share multiple perspectives.

2. Fostering equality

I.   Allowing equal access to all visitors and users of the systems irrespective of physical, social, cultural or any other relevant types of barriers.

II.   Enabling participation amongst a vast set of visitors and communities through meaningful dialogue and interaction.

III.   Addressing issues that relate to different types of inequalities such as income and committing towards societal improvement on a general level.

Overall, an engaging and dynamic UX is a top priority within SPICE and Case Studies would serve well to take into account all the points laid out in this subsection.

3.3 REGULATORY CONCERNS

The central aim of SPICE is to promote inclusion within and participation in cultural heritage. Inclusion refers to a person's ability to take part in action that s/he finds important and meaningful. Good accessibility is a precondition of inclusion. Accessibility takes into account the diversity of society. An accessible product or service is well-functioning regardless of the users' special characteristics.[33]

Working with collecting data from and communicating with end users and other people in the project should be carried out in a respectful way and securing privacy according to relevant regulations and legislation.

Here are some regulatory concerns that the case studies must be aware of:

1. Cultural accessibility
    i.   Cultural challenges
        a. Age
            - Ensuring content is targeted at intergenerational audiences.
            - Warnings and certain content are restricted to minors.
        b. Demographic
            - Being mindful of culturally sensitive material in relation to certain issues.
    ii.   Cognitive and linguistic challenges: Ensuring accessibility within materials by using, for example:
        a. Plain language
        b. Size of printed text
        c. Colour that accommodates diverse needs
        d. Pictorial representations
2. Physical accessibility

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[33] Lahtinen, E., Jakonen, O., & Sokka, S. (2017). Equality And Accessibility in Finnish Cultural Policy. *Center For Cultural Policy Research Cupore*

      i.   Mobility challenges
- a. Accessibility to spaces such as the use of ramps and elevators.
- b. Special assistance
- c. Travelling exhibitions
- d. Outreach

      ii.   Sensorial challenges
- a. Braille friendly
- b. Sign language
- c. Incorporating multisensory material for diverse needs

      iii.   Usability of methods and tools: Abiding my ISO's usability and accessibility standards (ISO 9241: 2018; 9241-210:2019)[34] and (ISO 30071:2019)[35]

      iv.   Security and privacy regulations

3. Each case adds their own privacy and security plans and must abide by GDPR's security and privacy regulations.
   a. Follow SPICE's data management plan.
   b. Use copyright permission and privacy forms.

3.4 SELF EVALUATION

As designers of systems and tools, researchers working with the elements in SPICE carry out periodic self-evaluations in order to frequently assess and reflect on the processes and outcomes of their development. The aim of self-evaluation is for the WPs is not only to improve their own processes, but dynamically articulate their own thoughts, emotions, philosophies, insights, and learnings as well. In order to manage time and maintain the flow of reflection, the mechanism for these articulations could be open, seamless, spontaneous and intuitive.

Here are some useful tools and approaches for self-reflection and evaluation:

- Field notes: Notes are geared towards interpretations, reflections and analysis of the processes of development. Some of these notes are private as a part of the research diary and others could be shared amongst everyone else at SPICE. The format could include writing and texts as well as scribbles, sketches, photographs, audio, video and others as well.

- Reflective probes: Design techniques in order to inspire ideas in a design process wherein the focus of design is open. In this case, it would also involve a reflection of a researcher's life experiences, values and thoughts that act as a catalyst for inspiration. It could be very useful in case a WP or a researcher is stuck in any process. More information about 'probing' (e.g. using instruments such as cultural probes) is outlined in the Appendix.

- Ethnographic interviews: These are conducted by WP7 and held with individual members of WPs and the Case Studies. The interviewees reflect on their past

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[34] Accessibility in digital products, *ISO 9241-11:2018*. ISO.
https://www.iso.org/cms/render/live/en/sites/isoorg/contents/data/standard/06/35/63500.html Accessed 6/11/2020.

[35] Information technology — Development of user interface accessibility — Part 1: Code of practice for creating accessible ICT products and services, https://www.iso.org/standard/70913.html, Accessed 9/11/2020.

activities, processes of development and short term as well as long term goals. The interviews are geared to be dialogue sessions wherein the interviewees informally reflect on their feelings and points of view of their design in case they have the desire to share it.

In their paper, *Structured Reflection for Improving Design Process*, Reymen and Hammer (2002) define reflection of a design process as "a combination of reflection on a perceived design situation and reflection on the remembered design activities". [36] The perceived design situation includes a "combination of the state of the design process, the product being designed, and the design context at the moment" while the design activities are the activities carried out during the process of design. This type of structured reflection performed on a regular or frequent basis in a systematic manner is bound to help in the improvement of future processes and outcomes. It is also useful for comparison and analysis, since the metrics for self-reflection and evaluation are the same during every period.

In addition, the other types of reflections that are necessary are:
- WPs that are more interconnected to and dependent on each other reflect on the processes and outcomes of teamwork as well as each other's development.
- Case Studies reflect on systems provided to them by the technical WPs and return feedback.

WP7 will communicate with the WPs and Case Studies and be responsible for facilitating and collecting these periodic reflections.

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[36] Reymen, Isabelle & Hammer, Dieter K.. (2002). STRUCTURED REFLECTION FOR IMPROVING DESIGN PROCESSES.

4. CASE STUDIES

SPICE Case Studies can be described as dynamic demonstrations that enable observation and testing of SPICE hypotheses and applications. Each case will include a characterization of the institution describing the Social and Cultural Infrastructural elements prior to SPICE followed by a description of how the Technical Infrastructural elements have been integrated onsite. The objective is to illuminate how together with the museum assets, the distributed co-designed ecology of SPICE Tools begins to seed a new discursive atmosphere to promote and sustain emergent modes of interpretation.

Each case study needs to abide by its bonding capital and bridging capital that was articulated by the partners when developing the project proposal.[37] Bonding capital refers to the strength of social connections within a group. On the other hand, the bridging capital is measured across different groups, accounting for the promotion of tolerance and understanding differences as well as recognizing commonalities.

The objectives of each case study are outlined and inferred from the development of Case Studies during the course of the project so far. Each case study is oriented around a set of rules and discourses. There are also special considerations that each case study needs to take into account; these considerations are not universal and are very specific to the case study at hand.

There are two main methodologies that will be used for the evaluation of the case-studies, namely:
- Research methodologies such as qualitative and quantitative data acquisition and analysis
- Participatory co-design activities used in creative workshops with end-user communities.

4.1 DESIGN MUSEUM - HELSINKI (DMH)

Museum of Design and decorative arts.

The Design Museum Helsinki is the national specialist museum of design in Finland. Founded in 1873, it is one of the oldest still active decorative art museums in Europe. Design Museum researches, collects, stores and documents design, and displays it both in Finland and in touring exhibitions abroad. Currently the museum holds over 75,000 objects, 45,000 drawings and 125,000 photographs. The original collection was established by the Finnish Society of Crafts and Design to serve the needs of the Craft School of Helsinki, the predecessor of the present-day Aalto University School of Arts, Design and Architecture. The first 700 objects were acquired in 1873 from the Vienna World's Fair. Today, the greatest part of the collection consists of Finnish ceramic and glass artefacts, including industry products. A curated

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[37] These proposals have been written in the project's grant agreement.

selection of objects is permanently on show at the collection exhibition Utopia Now – Story of Finnish Design and annually a great number of objects are loaned to exhibitions in Finland and abroad.[38]

4.1.1 Existing infrastructure

    I.   Social and cultural infrastructural elements

Design Museum Helsinki is a popular exhibition venue in Helsinki city centre with over 100 000 visitors annually. It serves free guiding and workshops regularly and a free Design Evening every month. There are special programmes for schools organised in collaboration with the City of Helsinki as well as teacher training with the universities. The *Design Academy*, a joint service with *Ornamo* the national association of designers and funded by the City of Helsinki provides special design courses run by designers for selected school groups. Special programmes and services for the elderly are currently being developed with Helsinki City and national networks of cultural senior work. The volunteers of the museum's friends' organisation Damy ry collaborate in public events. Accessibility to the national design collection is increased with the Design Attic exhibition concept, a hands-on exhibition and workshop participating the visitors to collections work. A major development project to increase impact nationally and make outreach outside the capital is the project initiating the National Learning Centre for Architecture and Design together with the Museum of Finnish Architecture during 2020-2023.

    II.   Technical infrastructural elements

Digitality is widely used in permanent collection exhibition Utopia Now - The Story of Finnish Design, with tablets and screened digital timeline for information and offering virtual reality experience of Finnish Pavilion in Paris World's Fair (1900) as well as immersion experience with Marimekko prints. The museum website has been activated with more material about exhibitions and collections to increase accessibility through online material. During past years, social media channels (Facebook, Instagram, Twitter, YouTube, Vimeo) have been harnessed to serve accessibility of online material and market events and also, to invite new visitors.

4.1.2 Bonding and bridging capital

Case Study	Bonding capital	Bridging capital
DMH	Enable senior citizens and families living far from the museum to engage with culture and share among themselves or with their communities regarding how their personal artefacts and interpretations connect to Finnish culture and design heritage.	Make their artefacts and interpretations available in virtual and touring galleries to provoke understanding and contributions across generations and geographical communities.

Table 14: The bonding and bridging capital of DMH.

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[38] This description has been derived from the project's grant agreement.

4.1.3 Activity objectives

I. Bridging distance gaps and lack of accessibility to the physical museum and the collection.
II. Developing methods and tools for addressing senior citizens and asylum seekers.
III. Enabling the sharing of personal stories about artifacts and design heritage and their association to Finnish identity and culture.

4.1.4 Rules and discourses

I. What is Finnish Design to you?
II. The variety of national identities.
III. Accessibility and sustainability.

4.1.5 Special consideration

I. Conducting workshops at local venues, e.g. libraries in small towns, rural areas as well as suburbs.
II. Tackling cultural and linguistic challenges with varied end-user communities such as asylum seekers.
III. Challenges of social media use in relation to algorithms, privacy, accessibility and more.
IV. Developing a portable museum collection in VR which invites personal interpretations:
    i. User experience of this output for a defined target audience who may not be tech savvy, digital experiences and interfaces may be unfamiliar.
        a. The range of interactions with interfaces is designed to be minimal, intuitive and seamless.
        b. Designing VR with special consideration to target group challenges such as motion-sickness and limited mobility. VR as a medium can potentially lead to motion-sickness and other challenges, especially amongst sensitive groups, therefore engagement with it should be gradual and monitored.
        c. Using co-design methods, constant testing with end-users and iterations based on the tests.
    ii. Working with WP3, WP4, WP5, and WP6 regarding aspects of user models, data management, interfaces, ontology and technical integrations for the 'travelling' museum.

4.2 GALLERIA D'ARTE MODERNA (GAM) - TURIN

Museum of Contemporary Art
Comprising a collection of 45,000 works spanning a period from the nineteenth century to the present day, with its paintings, sculptures, works on paper, installations, videos and photographs, the GAM offers its audience a wealth of events ranging from major exhibitions of Italian and international artists to highly contemporary research dedicated to a young

audience. The Education Department offers itineraries, activities and workshops for families, schools and people with disabilities. All areas are accessible.[39]

4.2.1 Existing infrastructure

I.   Social and cultural infrastructural elements
     GAM periodically hosts several programmes and activities for adults. Some of these programmes are centred around exhibitions wherein the Education Department at GAM engages in dialogue with audiences on topics such as history of art and cultural heritage during times of conflict and war. Similarly, the GAM Education Department has a tie-up with several schools offering activities and educational workshops. These workshops are organised according to the students' age. A top priority of GAM is to ensure that all areas and activities are accessible to visitors with special needs.

II. Technical infrastructural elements
     Currently, GAM hosts a growing collection of artist videos containing significant pieces in the history of art and 20th century experimental cinema. In addition, the comprehensive archive is designed to accommodate a growing collection of 'future memories. These collections are accessible on GAM's website. The museum has also launched a new digital platform and hosts an online 360-degree walkthrough of its environment.

4.2.2 Bonding and bridging capital

Case Study	Bonding capital	Bridging capital
GAM	Enable Deaf people and other visitors to actively participate in cultural interpretation and storytelling and connect and share their interpretations through social media functions.	Enable the contributions of Deaf people to be digitally accessible to others in the museum and online. Interconnect contributions using story features such as characters and emotions.

Table 15: The bonding and bridging capital of GAM.

4.2.3 Activity objectives

I.   Bridging the sensory (audio) gap.
II. Storytelling as a means to encourage participation, interpretation and reflection.

4.2.4 Rules and discourses

I.   Art interpretation.
II. Collaborative curation.

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[39] This description has been derived from the project's grant agreement.

III.   Accessibility as a prerequisite for participation in society on an equal basis with others.

4.2.5 Special consideration

I.   Development and integration of the SPICE app for collaborative curation:
   a.   Using this tool for sharing opinions and ideas on the collection
   b.   Sharing personal interpretations of GAM artworks within the app.
   c.   Receiving reactions to the interpretations commented on within the app.
   d.   Rigorous protection of users' data and privacy within the GAM app.

4.3 HECHT MUSEUM - HAIFA

Archaeology museum
The Reuben and Edith Hecht Museum at the University of Haifa was inaugurated in 1984. It was the initiative of the late Dr. Reuben Hecht, founder of the Dagon Silos in the port of Haifa and a founding member of the University of Haifa Board of Governors. The founding of the Museum that was to bear his and his wife's name may be cited as Dr. Hecht's crowning achievement in support of the University. He had previously established the Reuben Hecht Chair for the Study of Zionism and History and the Herzl Institute for Research and Study of Zionism. From his youth, Dr. Hecht was interested in the archaeology of the Land of Israel, and for a period of sixty years he assiduously collected archaeological artifacts representing the material culture of the Land of Israel in ancient times. He took special interest in finds from the Canaanite period to the end of the Byzantine period, a time of great significance for the Jewish people. Dr. Hecht, who was known for his Zionist activities, believed that archaeology was an important expression of Zionism and that the discovery of ancient artifacts was proof of the link between the Jewish people and the Land of Israel. [40]

4.3.1 Existing infrastructure

I.   Social and cultural infrastructural elements
   The museum includes an archaeological section dedicated to the history of the land of Israel and an art wing. The Permanent Archaeological Exhibition of the museum is based on the collection of the Museum's founder, who donated it to the university. The layout of the Hecht Collection is based upon two principles: that the displays are presented both didactically and chronologically and that the collection continues to highlight the Israelite period. The Hecht Museum, in addition to being an open (free) museum, serves as a study and research centre for students and academic staff, as well as a venue for enrichment studies in the fields of archaeology, art, history, and the Bible for school pupils, soldiers, teachers, and all other members of the community. The Museum holds an annual competition in plastic arts for high school pupils, soldiers, and students in the University's Department of Fine Arts. The Hecht Foundation grants scholarships to winners of these competitions, and awards fellowships to M.A. and Ph.D. students in the Departments of Archaeology and

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[40] This description has been derived from the project's grant agreement.

Maritime Civilizations. The Museum holds conferences, symposia, seminars, and lectures and publishes catalogues of its exhibitions of archaeology and art. *Michmanim*, the museum's annual publication, publishes scholarly articles on archaeological research and on artifacts in the Museum Collection.

II. Technical infrastructural elements
The museum maintains an active website in which there is information about the main exhibitions as well as the various events and activities held in the museum. In addition, the museum maintains a Facebook page to further disseminate this information. In addition, there is ongoing collaboration between the museum and researchers from the information department at the University investigating the use of novel technologies at the museum. Through this collaboration, a museum visitors' guide system was developed for the Hecht museum. It was available for visitors on a daily basis for three years and served (and continues to serve) also as a test bed for experimenting with novel technologies in the museum. Currently, the system is being used for research on Social Signal Processing where signals transmitted by devices carried by the visitors are used for modelling group behaviour, in order to reason about the state of the group visit. Another research direction focuses on the use of intelligent user interfaces in ubiquitous computing. Other issues like interaction with large, situated displays; interrupt management; navigation support; temporal and lifelong aspects of ubiquitous user modelling are also studied.

4.3.2 Bonding and bridging capital

Case Study	Bonding capital	Bridging capital
Hecht	Enable members of religious and secular communities, in particular minority populations, to express and share their viewpoints and appreciate the variety of opinions even within a community.	Provide support in the museum for accessing and exploring opinions across different communities in order to find similarities and also respect and understand differences.

Table 16: The bonding and bridging capital of Hecht.

4.3.3 Activity objectives
I. Enabling expression and sharing across religious, secular, and minority populations.
II. Understanding differences, diverse views and addressing conflicts.

4.3.4 Rules and discourses
I. History of the land of Israel from various perspectives.

4.3.5 Special consideration

I. Decision on how the personal information is entered and identification is received. This process must comply with the guidelines of GDPR as well as the consent guidelines developed in SPICE.
II. Infrastructure within the museum for sharing opinions and receiving comments
    i. Backend system fine-tuned to the topics at Hecht that provides this service
    ii. Frontend systems such as tablets.
    iii. Ensuring constructive discussion and engagement when dealing with more controversial topics.

4.4 IRISH MUSEUM OF MODERN ARTS (IMMA) - DUBLIN

Museum of Contemporary Art

The Irish Museum of Modern Art (IMMA) aims in all its activities to create for the public an enjoyable and engaging experience of contemporary art. It achieves this through a dynamic and changing programme of exhibitions and education programmes. As the national institution for contemporary art in Ireland, IMMA is committed to supporting artists' work, and works with artists and partners to support the development, understanding, and enjoyment of contemporary art. Based in its home, the 17th-century grounds and building of the Royal Hospital Kilmainham, IMMA works with partners nationally and internationally. IMMA takes responsibility for the care and maintenance of the national collection of modern and contemporary art, featuring over 3,500 artworks by Irish and international artists. The IMMA Collection is firmly rooted in the present and important new works are added to the Collection each year. IMMA ensures that it is accessible to visitors to IMMA and beyond through exhibitions, collaborations, loans, touring partnerships and digital programmes. The collection of modern art is regularly enhanced by purchase, commission, donation or loan with a particular emphasis on work from the 1940s onwards. IMMA was established by the Government of Ireland and opened to the public on 25th May 1991. IMMA is funded by grant-in-aid through the Department of Culture, Heritage and the Gaeltacht and by sponsorship, franchise and own resource income. IMMA attracts more than 400,000 Irish and overseas visitors every year.[41]

4.4.1 Existing infrastructure

I. Social and cultural infrastructural elements

IMMA often engages with teachers as well as students across varying age groups to provide guided tours and talks focusing on specific exhibitions. From time to time, there are also artist studio visits, continuous professional development (CPD) events for primary teachers, and practical workshops for pupils.[42] In addition, IMMA also provides a range of studio workshops, talks, tours, and cultural activities for families that is foreseen by the Engagement and Learning Department. In order to further inclusivity, IMMA also provides an arts programme for the elderly, and offers a variety of engaging creative events, workshops and resources for older people.

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[41] This description has been derived from the project's grant agreement.
[42] https://imma.ie/learn-engage/teachers-students/

II.   Technical infrastructural elements

IMMA maintains a comprehensive website that catalogues the entire collection of the National Collection of Modern and Contemporary Art.[43] This website also contains an archive of all the events that were held at IMMA. In addition, there is a SoundCloud page hosting all the talks held at IMMA as well as a YouTube channel with more than a thousand subscribers.[44] [45]

4.4.2 Bonding and bridging capital

Case Study	Bonding capital	Bridging capital
IMMA	Support groups who are less able to visit the museum physically, such as asylum seekers and children with serious illnesses, to access collections and share their own perspectives.	Make their perspectives available online and in the museum. Encourage visitors to think about universal, personal themes such as family to make interconnections across groups.

Table 17: The bonding and bridging capital of IMMA.

4.4.3 Activity objectives

I.   Addressing social distance (Equality) and class distance.
II.   Tools that enable sharing across vulnerable groups such as asylum seekers and children with serious illnesses.

4.4.4 Rules and discourses

I.   What is "family"?
II.   Different emotional responses.
III.   Cultural frameworks.

4.4.5 Special consideration

I.   Addressing issues related to inequality
    i.   Accessibility: Ensuring equal access to all end-user communities overriding physical, cultural and societal barriers.
    ii.   Accommodating diverse perspectives on politically charged issues and catering to the sensitivities of the users involved.

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[43] https://imma.ie/collection/
[44] https://soundcloud.com/imma-ireland
[45] https://www.youtube.com/user/IMMAIreland

II.   The workflow of the systems in the response room, especially with regard to the recommendation system.

4.5 MUSEO NACIONAL DE CIENCIAS NATURALES (MNCN) - MADRID

Museum of Natural History

The National Museum of Natural Sciences is one of the most important scientific research institutes in the country in the field of natural sciences. With a staff of more than 70 researchers in areas ranging from paleobiology and geology to ecology and climate change through environmental biology and biodiversity, the Museum is one of the emblematic centres of the Higher Council for Scientific Research (CSIC). Our challenge today is to transmit the knowledge generated by our researchers to society and for this we have highly qualified professionals dedicated both to the scientific collections that the Museum houses and to the exhibitions that allow us to explain scientific discoveries to the public that visits us. Our greatest hope is that our visitors have an entertaining time learning what our planet is like and how it has changed and the enormous diversity that it has harboured from the origin of life to the present.[46]

4.5.1 Existing infrastructure

I.   Social and cultural infrastructural elements

The National Museum of Natural Sciences is one of the most important scientific research institutes in the country in the scope of natural sciences. With over 70 researchers as part of the staff in areas ranging from paleobiology and geology to ecology and climate change including environmental biology and biodiversity, the Museum is one of the emblematic centres of the Spanish National Research Council (CSIC).

Our aim is to convey to society the knowledge generated by our researchers. We count on, for that purpose, our highly qualified professionals dedicated to the scientific collections and art exhibitions that the Museum houses, enabling explanations of scientific discoveries for the visiting public. We are thrilled to stimulate our visitors who can enjoy their time learning about our planet and how it has changed, about the tremendous diversity it has been home to, from the origin of life to the present.

II.   Technical infrastructural elements
      The museum has an extensive program of activities, for adults, school groups and families with children. Some of these activities are supported by digital media. For the visits of groups of children there are a number of tablets where to execute different activities, including a treasure hunt through the museum. There is also a 3D printer for training activities and there are beacons in the museum to support a guided tour application.

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[46] Translated to English from *Home page / Página de inicio*. Museo Nacional de Ciencias Naturales. Retrieved November 6, 2020, from http://www.mncn.csic.es/

4.5.2 Bonding and bridging capital

Case Study	Bonding capital	Bridging capital
Spain	Actively engage children, including those from lower socio-economic groups who may not consider science interesting or a career option, through activities such as games and puzzles.	Make anonymised contributions available across groups to explore differences of opinion on biodiversity and what individuals can and should do to protect the environment.

Table 18: The bonding and bridging capital of MNCN.

4.5.3 Activity objectives

- I. Engagement with children through interactive activities.
- II. Promoting broader discourse on biodiversity.

4.5.4 Rules and discourses

- I. What is biodiversity and why is it considered to be important?
- II. How does nature affect the way you live?

4.5.5 Special consideration

- I. Addressing the issues of inequality and researching whether/how activities such as games and puzzles could help in blurring barriers amongst children from varying socio-economic groups.
  - a. Ensuring that the parents of underaged subjects in the have provided appropriate permission for participation and all legal stipulations have been followed.
  - b. Complying with the laws regarding publishing images of and those created by minors.
- II. Broadening the scope for the discussion around biodiversity and extending it beyond the realms of:
  - a. Prehistory
  - b. Present state of biodiversity across the world
  - c. Connection to the present centred around topics such as:
    - Extinction
    - Climate change
    - Technology
    - Role of Spain
- III. Delving deeper into the aspects of gamification or the nature of interactivity implemented.
  - a. Role of gamification and whether it is fostering:
    - Learning

- Engagement
- Sharing
- Other values

b. Game mechanics to be implemented
c. Usage of new media and technology such as:
- AR/VR
- Mixed Media
- Other

This chapter has provided a present view of the Case Studies and provides a vision based on their existing infrastructure, objectives, rules and discourses and other unique considerations that each Case Study needs to be aware of. The ideas mentioned in this chapter constitute a mere handful of the extent of possibilities. Case Studies could also borrow ideas from each other as well treat these perspectives as anchors for creativity, thereby pushing their boundaries. WP7 will be in constant communication with the Case Studies and if any Case Study wishes to iterate or modify an area of development, they are free to engage with WP7.

5. PROJECTED RESULTS

1. SPICE advanced information processing tool set and Citizen Curation methodologies.

2. SPICE STS Map and design guidelines

The STS Map and design guidelines created for each of the Case Studies aim to achieve as much as possible an ideal of comprehensive accessibility that enables individuals and diverse groups to access heritage spaces and partake of the experiences and knowledge available regardless of their personal abilities and interests.

The STS Map intends to provide insights regarding the interaction between the social and technical realms. How and why are they woven in one another? When and where do the elements of one pull and push against another? Where do the knots occur causing a stop in the workflow? How can these be prevented?

3. FIVE working Cases as demonstrators

In the five Case Studies, we will create digital tools for communicating through sets of trials, all following their individually designed paths. Creating models for services and tools provides the concrete result of the project. The core aim and function of the SPICE project, however, lies within initial creative activity with our key target group, involving them as co-designers when creating new ways of participation and access to cultural heritage. We have a vision that within these processes, our target audiences can help us to better understand their needs and to develop our work in making cultural heritage a tool for dialogue and social cohesion. In Finland, based on the local case, we study a virtual pop-up museum touring in the country will be developed and we hope that it will join citizens in dialogue about design heritage.

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7. LIST OF TABLES

Tables

Figures

Fig1: WP3's pipeline and processes that lead to recommendation of content to users.

Fig2: WP4's linked data architecture color-coded according to:
Blue - Implemented systems
Green - Systems under testing
Yellow - Next steps
Orange - Undecided
Credit- Enrico Daga from WP4

Fig3: Work pipeline showing a detailed view of the process through which reasoning is carried out in the SPICE Toolkit.

Fig4. Facets of UX, reprinted from Hassenzahl and Tractinsky, 2006.

8. APPENDIX

Below is a catalogue of human centered and design-oriented methodologies list that could be valuable to the Case Studies and other research arenas in SPICE H2020:

1. **Activity analysis:** The method describes use of Cultural Historical Activity Theory to identify the diverse activity systems present (that need to be addressed) in a design situation.

2. **Affinity diagram:** Sorting device used to illustrate how a research question can be grouped into a set of sub-topics. The method is often used at the beginning of the process of analysis or when facts and thoughts are uncertain or needing clarification. See, Collins H. 2010. Creative Research, The Theory and Practice of Research for the Creative Industries, Lausanne Switzerland: AVA Publishers, pp.114–115.

3. **Anticipated experience evaluation (AXE):** The method employs a presentation that combines image pairs and scales. The image pairs refer to stimuli to aid participants in reflecting and expressing their experience, attitudes, opinions and beliefs towards a given product or concept. See also, https://www.allaboutux.org/axe-anticipated-experience-evaluation.

4. **Body storming:** This is a technique sometimes used in interaction design or as a creativity technique. The idea is to imagine what it would be like if the product existed, and act as though it exists, ideally in the place it would be used. It is going through an idea of improvised artifacts and physical activities to envision a solution. This User Experience Design (UXD) technique is ideal to design physical spaces (e.g. the interior design of a shop) but can also be used to design physical products or software. (Wikipedia, https://en.wikipedia.org/wiki/Bodystorming) Oulasvirta, Antti; Kurvinen, Esko; Kankainen, Tomi (July 2003). "Understanding contexts by being there: case studies in bodystorming". Personal and Ubiquitous Computing. 7 (2): 125–134. CiteSeerX 10.1.1.59.7715. doi:10.1007/s00779-003-0238-7. S2CID 1697822.

5. **Behavioural mapping:** Behavioural mapping is a research tool used to observe and record behaviours in a particular setting at a particular time. Behavioural mapping can be either place-based or individual-based, depending on whether the focus of observation is to identify locational or temporal patterns of behaviours. Objective: Define zones of spatial behaviour. Ng, Cheuk Fang, "Behavioural Mapping and Tracking", in R. Gifford, Research Methods for Environmental Psychology (https://onlinelibrary.wiley.com/doi/10.1002/9781119162124.ch3)

6. **Competitive product survey:** Find out about projects and products with similar objectives as ours. The procedure involves intelligence gathering from diverse sources including those that may not have been published in English or own own's vernacular language. The concept/product/service must first undergo a thorough analysis so as to discern its key characteristics. See, https://www.designmethodsfinder.com/methods/competitive-product-survey

7. **Contextual interviews:** Semi-structured or open interviews and observations in the natural environment in which the activity takes place (e.g. the museum). It might include both the museum personnel as well as visitors. See, https://www.usability.gov/how-to-and-tools/methods/contextual-interview.html

8. **Cultural probes:** These are qualitative research tools that can help the design process by gathering inspirational data about people's lives, values and thoughts. Usually, open-ended activities are provided to participants in order to trigger conversations about their daily lives. For more, visit https://dl.acm.org/doi/10.1145/291224.291235

9. **Empathy tools:** Use tools like clouded glasses, weighed gloves or being surrounded by a language you do not understand. The objective here is to prompt empathic understanding for users with challenges by literally putting oneself in the shoes of the other person.

10. **Experience mapping:** To understand the guest's activities during the visit, including the planning, decision-making, interaction with the institution's touchpoints, and continued engagement after the visit Outcomes: Touchpoint mapping and customer experience mapping.

11. **Game user research:** This is a useful method for analysing players' psychology through techniques such as play-testing. It also works well with other similar interactive mediums. More information here: https://grux.org/#1

12. **Paper prototyping:** This is a widely used method in user-centered design and often acts as a pre-cursor to digital prototypes because designers can quickly create sketchboards in order to map a user's journey. See, https://www.interaction-design.org/literature/topics/paper-prototyping

13. **Scenario design and personas:** Objective: To initiate a process of ideation regarding the use of the methods and tools created in real-world situations.Narrative(s) that describe hypothetical visits and interaction with heritage using our tools and methods. Descriptions of envisioned community end-user community members.

14. **Surveys and questionnaires:** These have been used quite widely and are often obvious choices to decipher users' preferences and feedback.

Here are some additional sources:

1. **IDEO Methods cards:** Method cards are popular tools used in a design setting intended to foster ideas and inspirations for new designs. They are often used within teams in order to explore and generate creative approaches, thereby serving as excellent participatory design tools. https://www.ideo.com/post/method-cards

2. **Wu, J.H. 2014. User Involvement in Service Design:** A Case Study on Designing a New Service Concept for Cultural Institutions. Master of Arts thesis, Aalto University, http://urn.fi/URN:NBN:fi:aalto-201409182646